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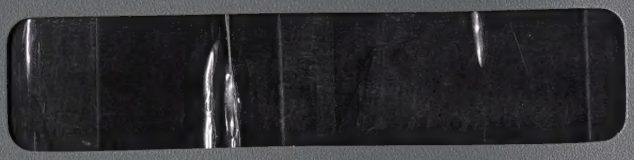

SYSTRON DONNER
Member THORN EMI Group

1700 Series

INSTRUMENT DIVISION

MICROWAVE SYNTHESIZER

Document No. 120087-02

SERVICE MANUAL

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CHAPTER 1

GENERAL INFORMATION

1-1. INTRODUCTION

1-1.1 This service manual is designed to assist the experienced service technician in maintaining the 1700 Series Microwave Synthesizer. The manual contains theory of operation, explanation of error codes and messages, performance verification test, calibration, replaceable parts list, and the necessary assembly drawings and schematics.

1-2. GENERAL DESCRIPTION

1-2.1 The 1700 Series of Microwave Synthesizers provide precise signals from 2.0 GHz to 26.5 GHz, and power outputs from −110 dBm to +10 dBm. The Model 1710 has a specified upper frequency limit of 8.0 GHz. The Model 1720 has a specified upper frequency limit of 18.0 GHz. The Model 1730 has a specified upper frequency limit of 26.499 GHz. Addition of Option 01 (Downconverter) extends frequency use down to 50 MHz (10 MHz with overrange). The AM, FM, and pulse modulation features provide added versatility for testing receivers. The 1700 Series has a choice of programming languages fitted as standard. Modular design permits faster servicing.

1-3. SERVICEABILITY

1-3.1 Internal diagnostics, through the use of error codes, locate most faults to easily replaceable plug-in printed circuit cards in order to reduce downtime. Further, the microwave section is designed with five separate easy to remove plug-in modules. Since most components are standard off-the-shelf items, provisioning requirements are not a problem.

1-4. TABLE OF SPECIFICATIONS

1-4.1 The specifications for the 1700 Series Microwave Synthesizer are listed in table 1-1.

1-5. OPTIONS

1-5.1 Options available for the 1700 Series Microwave Synthesizer are listed in table 1-2.

Table 1-1. Specifications

Frequency (See paragraph 1-2, General Description)	
Frequency Ranges:	2 to 26.5 GHz (depending on model).
External Time Base:	10 MHz, 1 to 3 V rms into 1 kohms.
Frequency Resolution:	0.1 Hz, 1 kHz with Option 03.
Frequency Accuracy:	Equal to time base.
Internal Time Base:	10 MHz; aging rate is ± 5 parts 10^{-10}/day.
Reference Output:	10 MHz, 2.2 V peak-to-peak level into 1 kohm.

Spectral Purity (0 dBm) (Notes 2, 4, 6)	
Harmonics and Subharmonics	−55 dBc
Spurious (CW and AM Modes) Non-harmonically related:	−50 dBc, excluding line related spurious.
Power Line Related:	60-Hz specification degrades by 5 dBc at 50 Hz.

Frequency Range (GHz)	Offset from Carrier		
	< 300 Hz	0.3 to 1 kHz	> 1 kHz
0.05 to 2	−40	−50	−60
2 to 8	−40	−50	−60
8 to 18	−35	−45	−60
18 to 26.5	−30	−40	−60

Table 1-1. Specifications – Continued

Single Sideband Phase Noise	Measured in a 1-Hz noise BW, CW Mode (readings in dBc).				
Frequency Range (GHz)	Offset from Carrier				
	30 Hz	100 Hz	1 kHz	10 kHz	100 kHz
0.05 to 2	−58	−67	−85	−85	−103
2 to 8	−61	−67	−87	−87	−104
8 to 18	−54	−60	−80	−80	−97
18 to 26.5	−50	−55	−75	−75	−90

Amplitude Modulation (Note 3)	
AM Depth:	0 to 90% at level vernier setting 6 dB below maximum specified leveled output (15° to 35°C).
AM Rates (3 dB bandwidth):	100 Hz to 50 kHz.
AM Sensitivity:	1 V peak into 600 ohms nominal for 100% external modulation input.
Frequency Modulation	
Peak Deviation:	> 1 MHz (15° to 35°C).
FM Rate (3 dB bandwidth):	100 kHz to 1 MHz.
FM Sensitivity:	1 V peak for 1 MHz deviation; external input into 50 ohms nominal.
RF Output (1710: 2 to 8.0 GHz) (1720: 2 to 18.0 GHz) (1730: 2 to 26.5 GHz) (Note 3)	
Resolution:	0.1 dB.
Output Impedance (nominal)	50 ohms.
Output Level Range (Notes 2, 3, 5):	−120 to > +10 dBm (> +3 dBm for Options 4, 12). −100 to +6 dB (18 to 26.5 GHz).
Unleveled Output Power Typical (Note 4):	> +13 dBm (Option 04 +5 dBm).
Flatness and Accuracy (Notes 2, 3, 5):	±1 dB, −65 dBm < P out ≤ +10 dBm. ±2 dB, −100 dBm < P out ≤ −65 dBm.
Level Switching Time:	
Attenuator:	≤ 25 ms/step change.
Level Vernier:	≤ 10 ms/step change.

Table 1-1. Specifications — Continued

Pulse Modulation	This is an internal high-speed pulse modulator with external input.
Rise/Fall Time:	≤ 25 ns (35 ns F (< 2 GHz).
Leveled Pulse Width:	200 ns — 5 ms
Pulse Repetition Rate:	100 Hz — 1 MHz (usable to 10 Hz).
Input:	TTL levels on front panel bnc connector.
Minimum Time Between Pulses:	300 ns.
On/Off Ratio:	≥ 80 dB at 0 dBm Leveled Output.
Delay (Time between 50% levels of TTL input and RF output):	300 ns nominal.
Low Frequency Output (Option 01)	This option extends the frequency range down to 50 MHz.
Frequency Range:	0.05 to 2 GHz (10 MHz underrange).
Harmonics:	≤ −40 dBc (Notes 2, 4, 6).
Spurious:	≤ −50 dBc (Notes 2, 4, 6).
Frequency Resolution:	0.1 Hz.
Level Flatness and Accuracy:	Same as standard 1700.
Output Power:	Same as standard 1700.
Remote Programming IEEE-488	
Remote Command Syntax:	Programmable using S.D. 1700 Series Programming Language, Control Interface Intermediate Language, and with Option 13, S.D. Model 1618 Programming Language.
Frequency:	Programmable in 0.1 Hz increments (1 kHz increments with Option 03), from 2 GHz (10 MHz with Option 01) to 8.999 999 9999 GHz for Model 1710, to 18.999 999 9999 for Model 1720, and to 26.999 999 9999 for Model 1730.
Output Level:	Programmable in 0.1 dB increments from −120.0 dBm to +20.0 dBm (−10.0 dBm to +20.0 dBm with Option 02) (−127.0 dBm to +13.0 dBm with Option 04 or 12) (−17.0 dBm to +13.0 dBm with Option 02 and with Option 04 or 12).

Table 1-1. Specifications — Continued

Modulation:	Permits selection of CW, Pulse, AM, and/or FM.
Mode:	Permits selection of internal or external ALC, and internal, external, or automatic selection of 10 MHz timebase.
Status Reporting:	When addressed to talk, status of leveled condition, locked condition, external modulation, internal tests, and remote programming errors. In 1618 Mode (Option 13), reports status of leveled and locked condition.
Program Execution Time, Interface Load Rate from Bus:	50 μs/character.
Program Execution Time, Data Transfer to Synthesizer:	30 ms typical (measured from receipt of Line Feed or End to RF Valid Low).
Frequency Switching Time:	< 10 ms typical for < 1 MHz change, 50 ms typical for $\geq$ 1 MHz change, 150 ms for Band change (measured from RF Valid Low to RF Valid High).
Digital Step Sweep Frequency and/or Level	
Sweep Function:	Frequency: Start (F1)/Stop (F2). Level: Start (P1)/Stop (P2).
Sweep Mode:	Single, Continuous, Ext Triggered Sweep (TTL input).
Step Size:	Minimum ±0.1 Hz. Maximum frequency range of unit. Minimum ±0.1 dB. Maximum power range of unit.
Step Dwell Time:	0 to 999 ms per step. (See note 7.) 0 to 2.0 sec per frequency step (except in 1618 mode — Option 13).
RF Valid:	TTL output high = RF locked and level stable. Low during frequency and/or level switching, high during step Dwell Time. Remains low if RF does not stabilize.
General	
Operating Temperature Range:	0° to 50°C (15° to 35°C for specified accuracies).
Weight:	56 lbs (23 kg); Shipping weight approximately 64 lbs (26 kg).
Power:	100/115 or 200/230 V ac ±10%, 48 to 400 Hz, 250 W.

Table 1-1. Specifications — Continued

Dimensions:	W × D × H: 17 in. (43.2 cm) × 24 in. (61 cm) × 5.25 in. (13.4 cm).
Rack Mounting:	Rack mount kit supplied with unit.
Frequency Bands (GHz):	2 to 8 (All models), 8 to 18 (1720, 1730), 18 to 26.5 (1730).
With Option 01:	0.05 to 2.0 GHz added.

NOTES:

1. Stability and spectral purity will be affected by characteristic of external reference oscillator.
2. At 0 dB step where applicable into 50 ohms in leveled mode.
3. 15° to 35°C.
4. Spurious content may degrade at power levels other than specified output.
5. Accuracy and level relative to digital output display with internal leveling.
6. Relative to carrier at specified output.
7. Fixed delay is normally 10 ms. Frequency switching time is 50 ms for 1 MHz or greater change and 150 ms for Band change.

Table 1-2. Options

Options	Description
01	Extended low frequency output (50 MHz with 10 MHz overrange).
02	RF output without attenuator.
03	Reduced resolution (1 kHz).
04	Deletes pulse modulation and reduces output power to +3 dBm.
05	RF outputs and Modulation inputs on rear panel.
06	Rack Mount.
12	+3 dBm output power.
13	1618B Language fitted.

CHAPTER 2

THEORY OF OPERATION

2-1. GENERAL

2-1.1 The 1700 Series Synthesizers utilize a three-loop approach (figure 2-1) for frequency synthesis. These three loops provide synthesized frequencies in 0.1 Hz increments from 2.000 — 26.499 999 9999 GHz. The addition of a Downconverter provides synthesized frequencies from 50 MHz to 1.999 999 9999 GHz, again in 0.1 Hz increments.

2-1.2 The Timebase (figure 2-2) is composed of a phase-locked times ten multiplier followed by four buffer amplifiers, one of which feeds digital dividers P_5 and P_4 with a total division ratio of one hundred. The output of P_4 is therefore 1 MHz and becomes the reference for the Fine Loop Synthesizer.

2-1.3 The phase-locked times ten multiplication mentioned above is accomplished by phase-locking a Colpitts type High Q, voltage controlled crystal oscillator, to either the internal 10 MHz standard or a stable external 10 MHz source.

2-1.4 Phase-locking takes place by dividing the 100 MHz signal by ten (P_6) and feeding this divided signal to the 12040 Phase/Frequency detector. The second signal to the 12040 Phase/Frequency detector is furnished by either an internal or external 10 MHz standard. When both inputs to the 12040 Phase/Frequency detector are equal in frequency, a voltage proportional to the phase difference between the two input signals is generated and fed to the Loop Amplifier which in turn drives the voltage variable capacitor (Varicap). This capacitor is in series with the 100 MHz crystal and provides about ±1 kHz of control range. The voltage from the loop amplifier varies the 100 MHz crystal oscillators' frequency until it is exactly ten times the frequency of the 10 MHz standard; i.e., phase-lock occurs.

2-1.5 The Coarse Loop Synthesizer (figure 2-3) is a step locked loop which steps in approximately 100 MHz steps from 2 to 8.7 GHz. This is accomplished by feeding the 100 MHz frequency from the timebase VCXO to the step recovery diode (SRD) via a SRD driver. The SRD creates a spectrum (sin x)/x with a period of 100 MHz and adequate energy past 8 GHz. The spectrum is convolved in the microwave sampler with the signal from the 2 — 8 GHz YIG Oscillator (YTO). The oscillator is programmed via the main tune digital-to-analog (D/A) converter so it is close to the desired output frequency (within ±30 MHz). The output frequency of the sampler is the difference between the closest 100 MHz SRD generated harmonic and the YTO frequency. This IF frequency is amplified by the IF amplifier 10216 and fed to the 12040 phase/frequency detector. The other input to the phase/frequency detector is either 2—3 MHz or ⅗—1 MHz from the fine resolution reference synthesizer. Assuming it is 2 MHz, the output of the loop amplifier will generate a voltage that is applied to the voltage-to-current converter and then fed to the FM coil to the YTO in a direction that will force phase-lock to occur, in this case, when the IF frequency equals 2 MHz. The output frequency will then be the sum of 2 MHz + N100 MHz. Assuming we desired the output frequency to be 7.602 GHz, N will be 76, since 2 MHz + (76 × 100) MHz = 7.602 GHz. As with any IF loop, the phase/frequency discriminator has a tendency to latch in one condition causing positive feedback and a saturation of the loop. The function of the kicker (generally, a Schmitt trigger) is to sense the latched condition and slew the loop amplifier in the opposite direction where the phase/frequency discriminator will force the loop to acquire lock (negative feedback).

2-1.6 The directional coupler and the attenuator provide isolation between the YTO and the sampler in order to minimize 100 MHz sampling sidebands (>−100 dBc).

2-1.7 The Fine Loop Synthesizer (figure 2-4) is a carefully designed low noise programmable synthesizer. In order to keep the loop's bandwidth high and at the same time minimize phase noise, three low noise Colpitts oscillators were designed utilizing hyperabrupt variable capacitors (varicaps) for frequency control. The microprocessor selects the appropriate oscillator and sets the divide-by-N to the desired number. The range of the divide-by-N is 98 to 397.

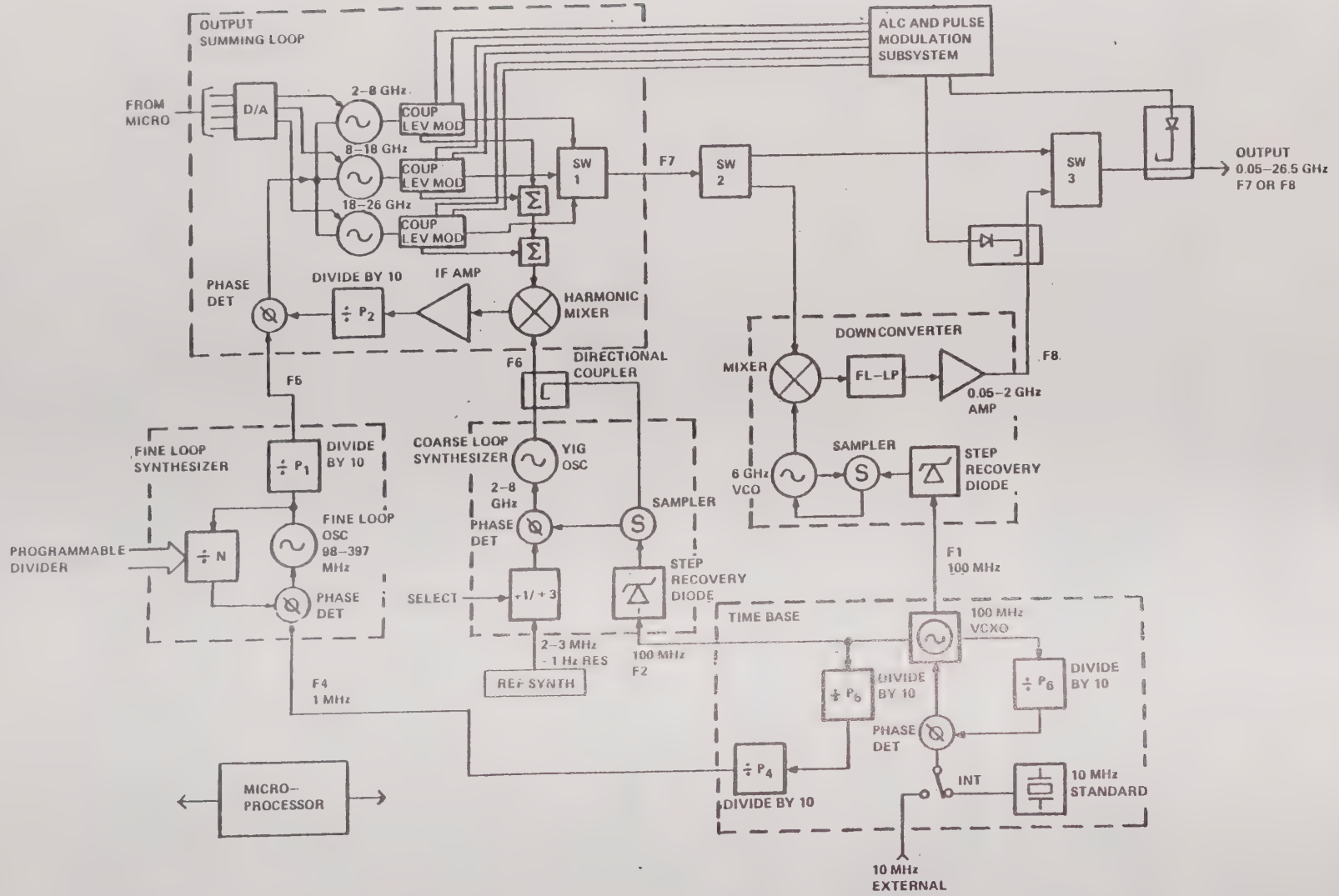

Figure 2-1. 1700 Series Simplified Block Diagram

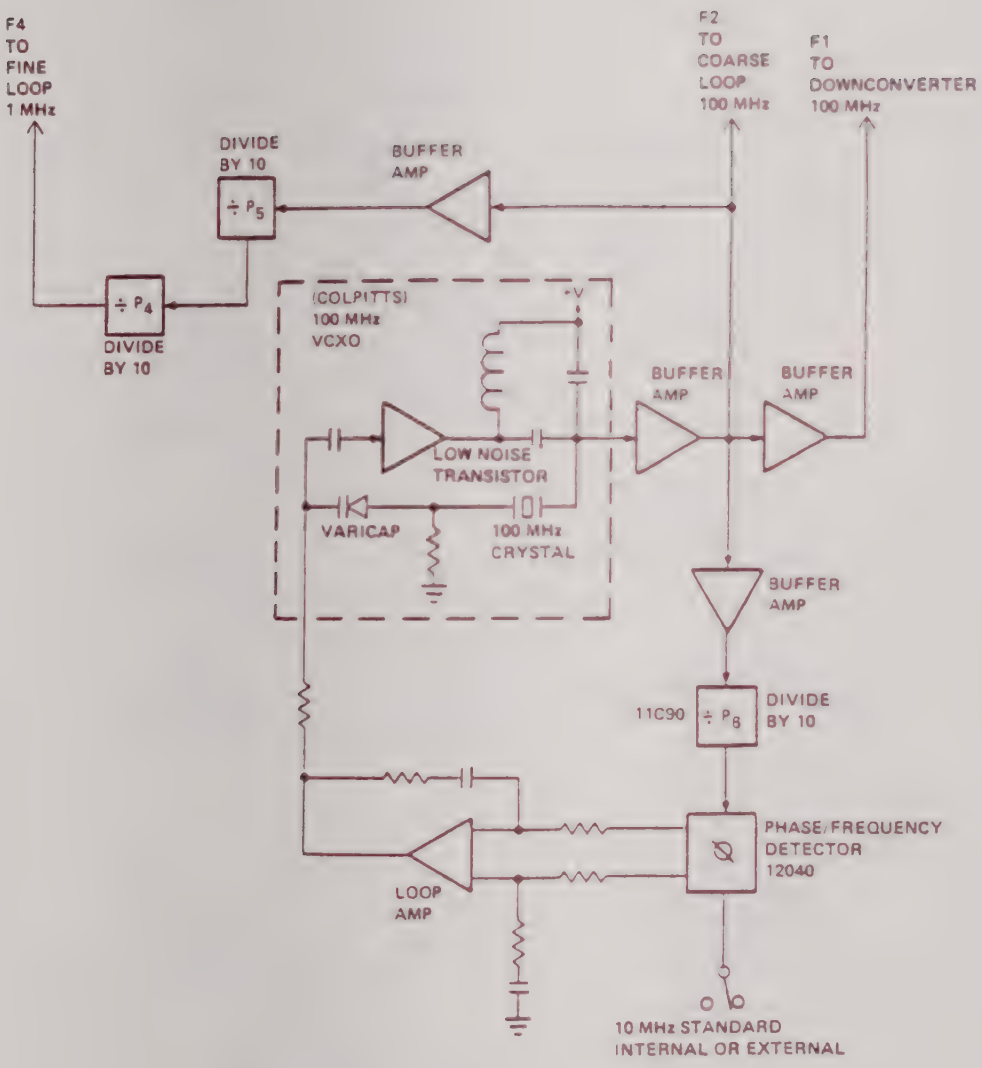

Figure 2-2. Timebase Block Diagram

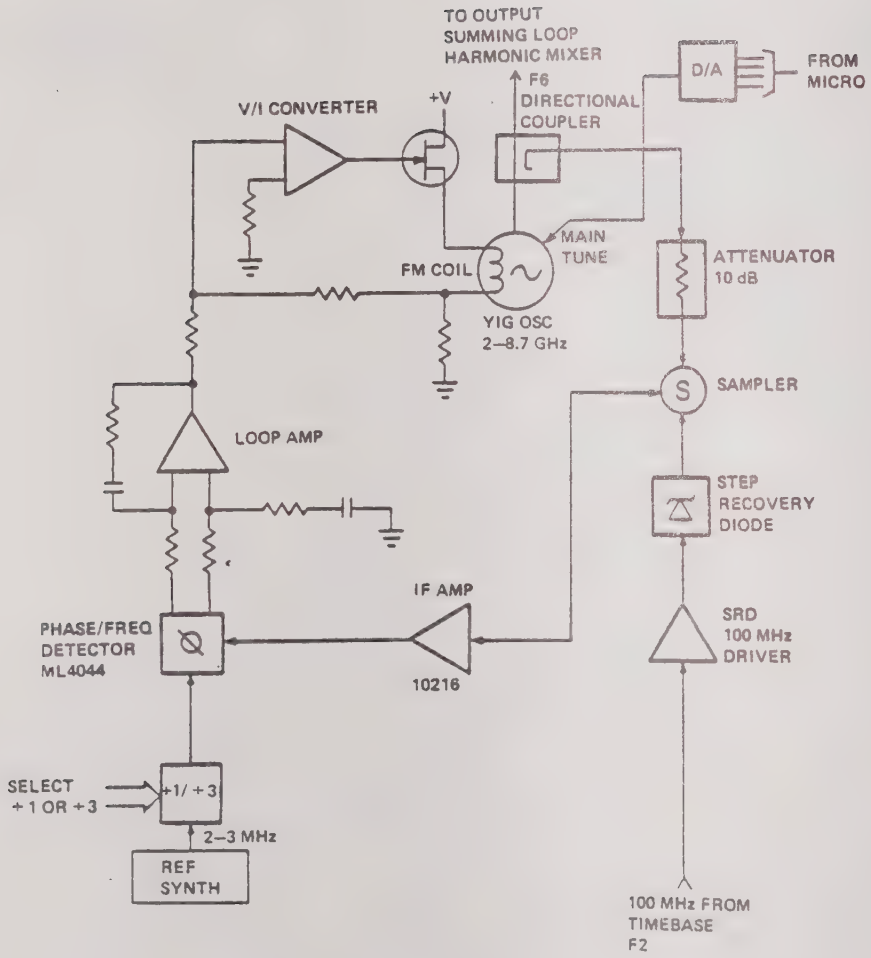

Figure 2-3. Coarse Loop Synthesizer Block Diagram

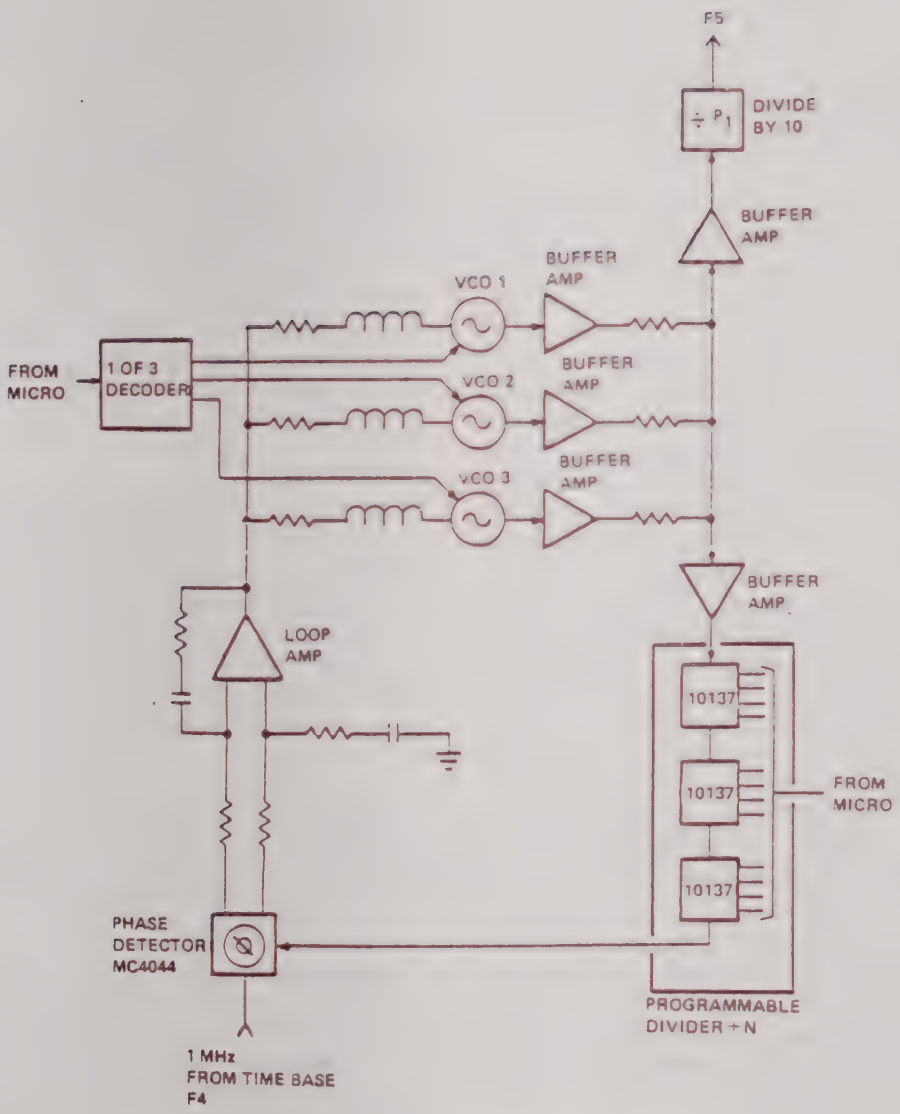

Figure 2-4. Fine Loop Synthesizer Block Diagram

2-1.8 The operation of this loop can be illustrated by assuming a desired output frequency of 39.7 MHhz. The frequency before the output divide-by-10 P_1 must be 397 MHz. Therefore, oscillator #3 will be selected and the N must be set to 397. If the #3 oscillator is not at the proper frequency, the output from the divide-by-N will be other than 1 MHz to the divide-by-N output and generates a voltage in a direction which will steer the #3 oscillator to 397 MHz. When this happens, the output of the divider will be 1 MHz and phase-lock will occur. The speed at which this lock occurs is related to the loop bandwidth and the programming time of the dividers. Worst case lock time is typically better than 10 msec.

2-1.9 The Output Summing Loop (figure 2-5) sums the Coarse Loop Synthesizer frequency and the Fine Loop Synthesizer frequency to provide the final output frequency.

2-1.10 Three low noise YTO's cover the frequency range from 2 — 26.499 MHz. In the 2 — 7.999 MHz range, the harmonic mixer is used in its fundamental mode. To best illustrate the operation of this loop, let's assume a desired output frequency of 7.999 MHz. The microprocessor will program the Fine Loop Synthesizer's divide-by-N to 397. After division by 10, the input frequency to the 12040 phase detector is 39.7 MHz. The 12040 acts as a frequency discriminator when the loop is not locked. It generates an output voltage that drives the loop amplifier and ultimately is fed to the voltage to current converter. This current is applied to the 2 — 8 GHz YTO FM coil so that, after mixing with the 7.602 GHz input from the Coarse Loop Synthesizer, Intermediate Frequency (IF) in the range of 400 MHz is produced. This current is applied to the 2 — 8 GHz YTO FM coil so that after mixing with the 7.602 GHz input from the Coarse Loop Synthesizer, Intermediate Frequency (IF) in the range of 400 MHz is produced. This signal is amplified by the 600 MHz leveled IF amplifier and fed to the 11C90 ECL divide by 10, producing a signal in the range of 40 MHz. As the current into the FM coil varies, it will drive the loop to the desired locked point which is 39.7 MHz.

2-1.11 In order for lock to occur, both frequencies into the phase detector must be identical; therefore, it follows that if the difference between the output loop oscillator and the 7.602 GHz input frequency from the Coarse Loop Synthesizer is 397 MHz, the output YIG OSC must be phase-locked to 397 MHz + 7.602 or 7.999 GHz.

2-1.12 Similar operation occurs above 8.000 GHz with the exception that the Harmonic Mixer will be operating in the third harmonic mode. This operation can be understood by assuming that a third harmonic mixer is a standard mixer preceded by a times 3 multiplier. In this third harmonic mode, the frequency of the Coarse Loop Synthesizer must be programmed to be one-third of the desired frequency prior to mixing in order to provide the proper IF frequency that can be compared to the Fine Loop Synthesizer output in phase detector 12040.

2-1.13 The Downconverter (figure 2-6) is composed of a 6.005 GHz phase-locked voltage controlled oscillator (VCO), a mixer, a 2 GHz low pass, stripline filter and a wideband (0.01 — 2 GHz) amplifier. In the downconverter mode (output frequency below 2 GHz), switch SW3 is activated and the output loop signal is fed to the mixer. This 6.055 GHz — 7.999 GHz signal mixes with the fixed 6.005 GHz VCO and produces an output in the range of 0.05 — 1.999 GHz. The upper sidebands (12 — 14 GHz) are reduced by more than 60 dB by the action of the 2 GHz low pass filter.

2-1.14 The wideband (0.01 — 2 GHz) amplifier amplifies the desired signal 37 dB. This amplifier delivers +17 dBm into 50 ohms with low total harmonic distortion. Spurious signals are less than −55 dBc. This is accomplished by choosing a high enough (7.999 GHz divided by 6.000 GHz = 0.75) mixing ratio so that only ninth order mixing products are present at the output of the mixer.

2-1.15 Phase-locking the 6.005 GHz VCO (the same YIG oscillator used for the 8 — 18 GHz output) is accomplished by taking the 100 MHz input from the timebase and feeding it to the step recovery diode (SRD) via the SRD driver. The snap action of the SRD creates a (sin x)/x spectrum with a period of 100 MHz and adequate power (−20 dBm) at the 60th harmonic of 100 MHz (6 GHz). This SRD signal is then mixed in the sampler/phase detector with the 6 GHz VCO. The difference frequency is compared to the 5 MHz reference input and a voltage is applied to the VCO in a direction necessary for lock to occur. The VCO's drift versus temperature and versus time requires a search oscillator be used in order to increase the capture range and assure proper phase-lock.

2-1.16 When the loop is out of lock (positive feedback), the loop amplifier turns into a Wayne Bridge sinewave oscillator, the frequency of which is

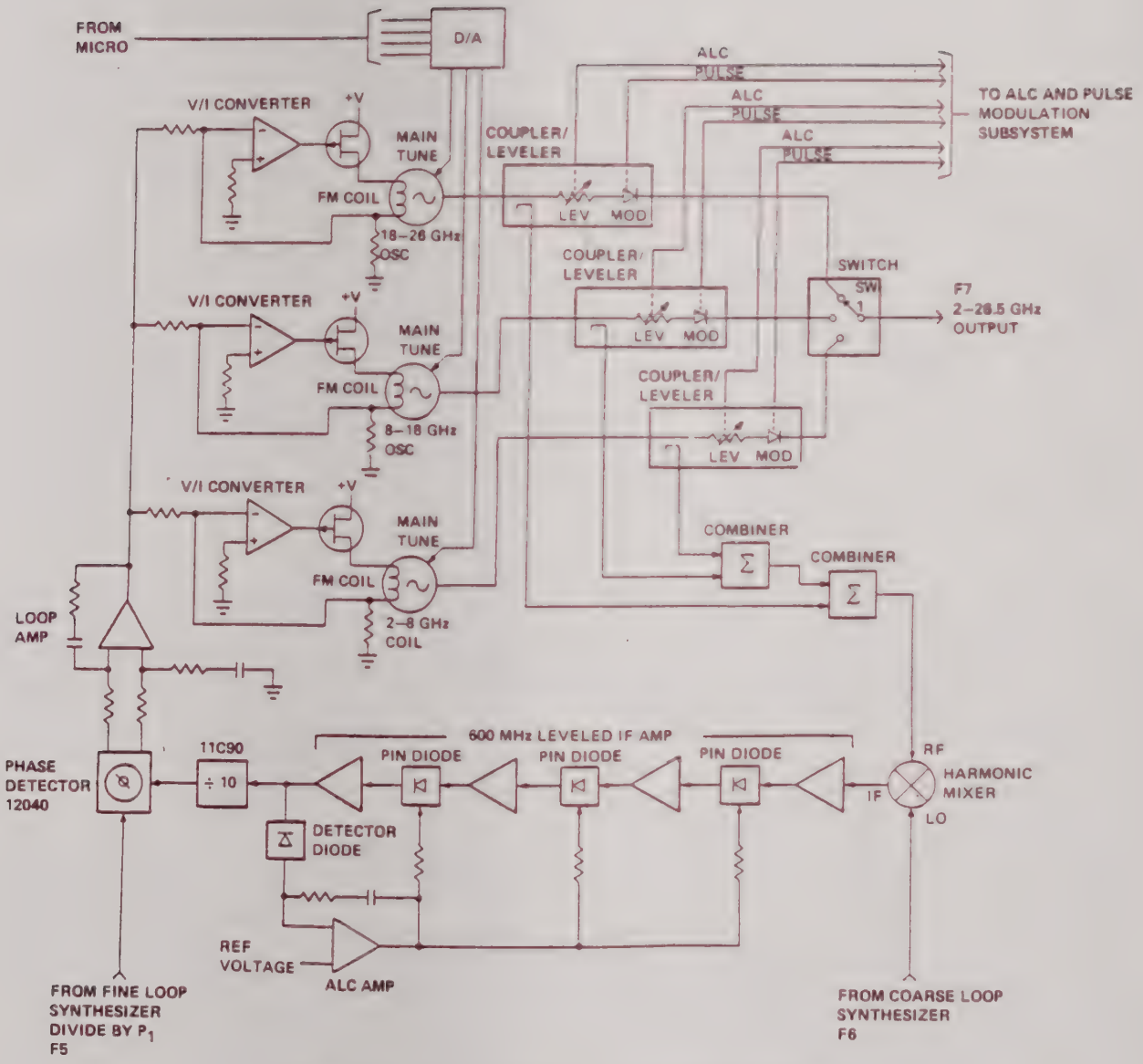

Figure 2-5. Output Summing Loop Block Diagram

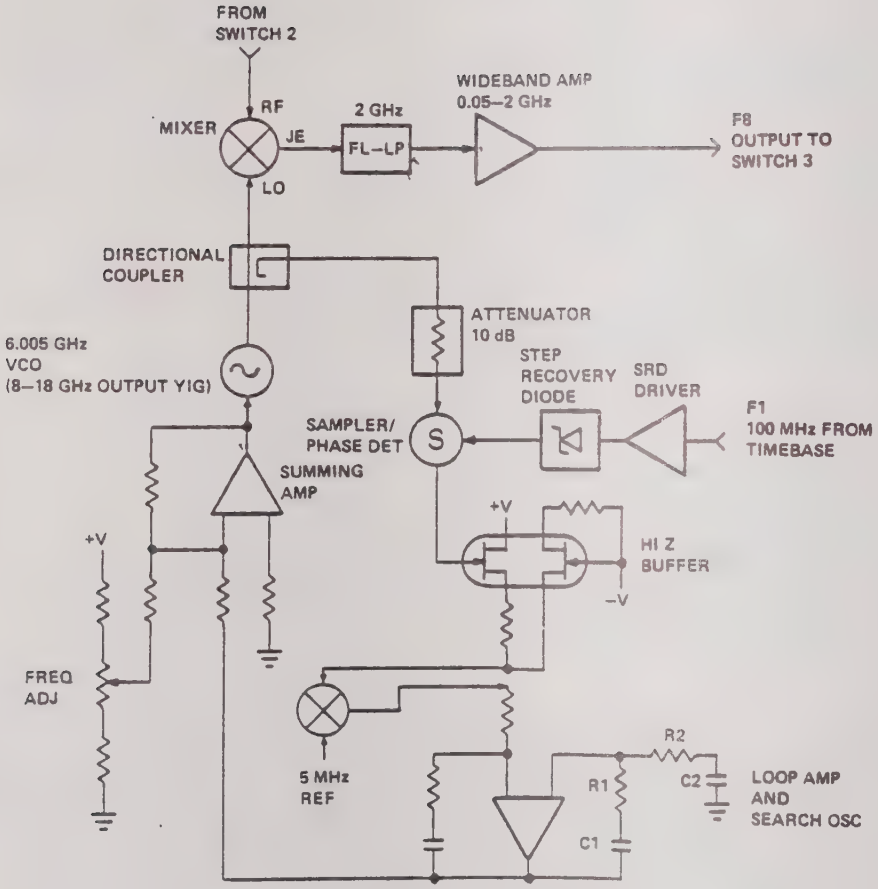

Figure 2-6. Downconverter Block Diagram

determined by the RC time constant of R1, C1 and R2, C2. This oscillator stops oscillating as soon as the negative feedback exceeds the positive feedback when the loop is locked (negative feedback).

2-1.17 The Leveling circuitry (figure 2-7) permits control and adjustment of the instrument's RF output level. Two directional detectors are used to sample the level of the RF output signal. One of these operates to 995 MHz, while the other functions from 995 MHz to 26.5 GHz. The two detector outputs are applied to a pair of video amplifiers which provide a voltage gain of 12 to their input signals. A high-reliability relay selects the appropriate output, depending on the selected frequency.

2-1.18 Once it reaches the amplitude control circuit board, the signal from the video amplifier is split into two separate paths, one for CW operation and the other for pulse modulation operation. The detector output is a DC level in the CW mode and a pulse waveform in the pulse modulation mode. In this latter case, the pulse output must be converted to a DC level. Furthermore, due to the resistance and capacitance of the detector and video amplifier, differenct circuit gains are required for the two operating modes.

2-1.19 In the CW mode, precision amplifiers on the amplitude control board are used to provide additional gain and an appropriate DC offset. In the pulse modulation mode, the signal from the video amplifier is a pulse, and this is converted into a DC level by a fast, accurate sample-and-hold circuit. As with the CW mode circuitry, precision amplifiers then provide additional gain and an appropriate DC offset.

2-1.20 The appropriate processed detector signal is selected by a switch and applied to the input of a logarithmic amplifier which makes the conversion from milliwatts to dBm. The output of the logarithmic amplifier is compared by an error amplifier to the output of a digital-to-analog converter (DAC) whose output is proportional to the desired output level in dBm, plus or minus any corrections necessary to take care of insertion losses and flatness variations. Any difference between the actual and the desired output power levels is converted to an error voltage which, in turn, is transformed into current by the three driver circuits. The outputs of these drivers are applied to PIN diodes in the three microwave modules, whose attenuation varies as a function of their input current. This closes the level control loop.

2-1.21 In the pulse modulation mode, the pulse modulator diodes in the three microwave modules are either off or on, passing the module's input signal or reflecting it back to the YIG oscillator. Additional circuitry delays the turn-on and turn-off of the pulse modulators with respect to the opening of the sample-and-hold gate so that the differing characteristics of the three pulse modulators and the various system propagation delays can be compensated for. This assures that the sample-and-hold gate opens only when the pulsed microwave signal is present at the appropriate directional detector.

2-2. OPERATING SYSTEMS

2-2.1 The 1700 Series Synthesizers maximize user friendliness, serviceability, and RF performance. The instruments were designed to be digital wherever possible to simplify updates and improvements to the firmware (internal EPROM program). A digitally designed instrument minimizes the number of analog adjustments, which allows faster calibration and improved reliability.

2-2.2 At turn-on, the firmware initializes the hardware and then performs a thorough self-check. If no faults or errors have been found, the 1700 Series is set to the CW frequency of 2.000 GHz at a power of −110 dBm.

2-2.3 Modification to the current instrument setup, either by the front panel or the General Purpose Interconnector Bus (GPIB), initiates an interrupt to the Central Processor Unit (CPU). The CPU interrogates the interrupt generating device for details of the update. Assuming this update causes a frequency function or parameter change, the CPU interprets the data, drives the coarse frequency controlling digital-to-analog converter's (DAC) to the appropriate voltage, and presets the programmable dividers of the coarse and fine loops. A correction for the insertion loss of the attenuator and the non-linearity of the amplitude control loop characteristics is fetched from the calibration data stored in the EPROM and applied to the desired RF output level. Thus, both the frequency and level are as accurate as possible. The display is also updated to reflect the new setup. Assuming no new interrupt is received, the CPU now does housekeeping routines including a continual check of the loop error voltages, phase-locked loop (PLL) and leveling status, rear panel changes, the front panel increment/decrement, and update of the real-time clock. Any changes or interrupts at this point will cause a series of actions similar to those previously described.

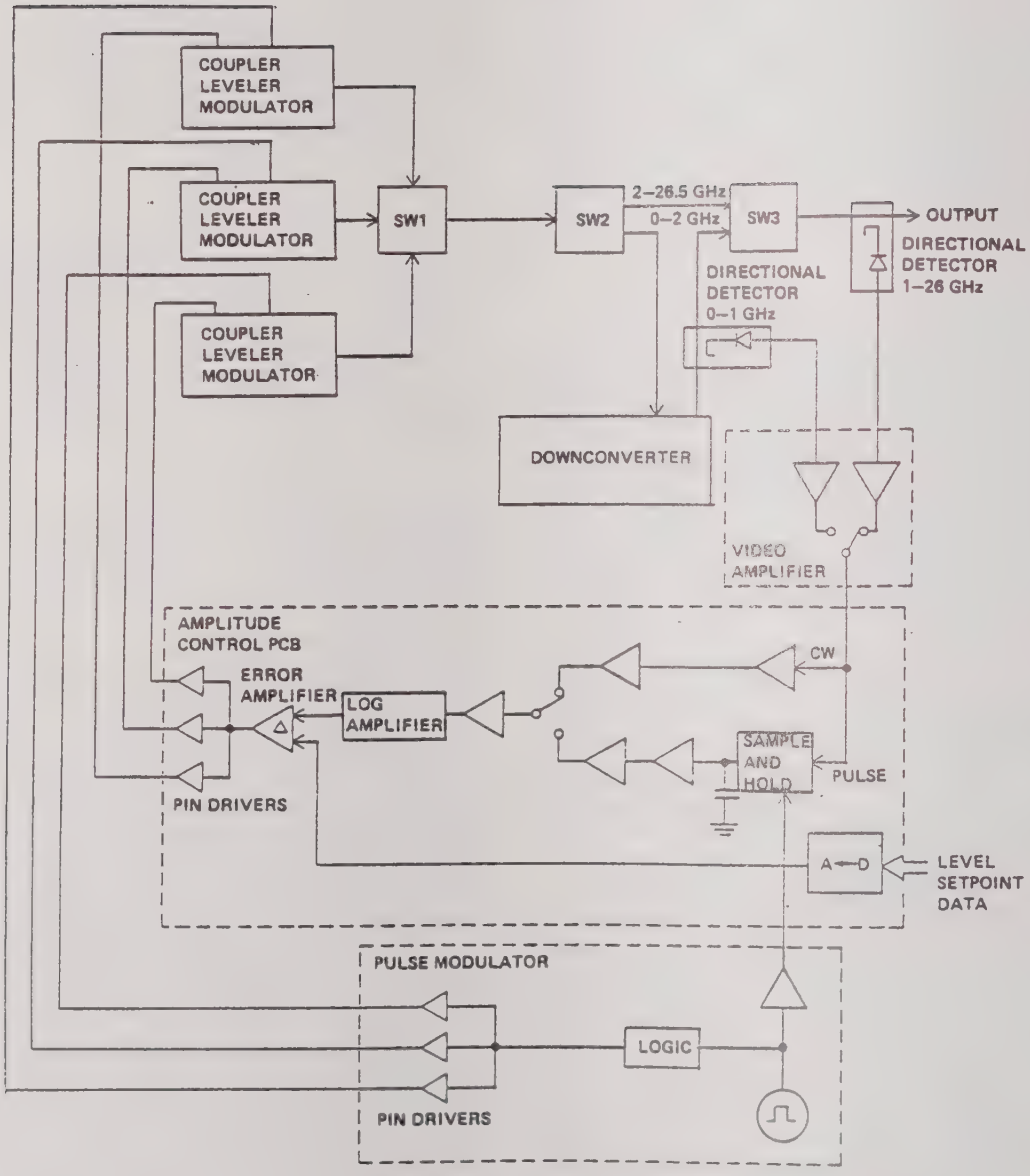

Figure 2-7. Amplitude Control & Pulse Modulation Subsystem Block Diagram

2-2.4 The microprocessor is the Motorola 6802, an 8-bit processor which uses an 8-bit data bus and a 16-bit address bus. The data and address busses are confined to the A2 board to eliminate them as a source of interference. Three Peripheral Interface Adapters (PIA) are used to control and receive status from the rest of the 1700 hardware. The block diagram of the microprocessor board is shown in figure 2-8.

2-2.5 The processor treats each element connected to it as an element that can be written to, read from, or both. The processor PCB is configured with 48 K-bytes of EPROM firmware (only part of the 48K is used while the rest is reserved for growth) to define the power-on, self-test, and operating system. Additionally, there are 2 K-bytes of scratch pad RAM, 2 K-bytes of battery backup for the front panel setup, and 8 K-bytes of EEPROM which describes the synthesizer's particular configuration or "personality", and holds the frequency response calibration data for the leveling and attenuator. The 48 K-bytes of EPROM are divided into three 16 K-byte EPROM's. A programmable interval timer is used to provide an accurate timebase for the operating system and to provide various control routines.

2-2.6 The 1700 Series software involves real-time operations and is interrupt driven. It is broken into two logical sections: supervisory and action functions. The supervisor is responsible for such upper level tasks as data entry, parameter range checking, display update, and the invocation of the appropriate action routines. The action functions control or monitor specific instrument functions. There is a separate action routine for each function such as output frequency setting, output power level setting, etc.

2-2.7 The GPIB interface interrupt is given the highest priority to minimize the response time to bus commands. The keyboard interrupt is given a lower priority because it is a slower interface.

2-2.8 The GPIB interface consists of a GPIB interface chip and bus transceivers. The GPIB address is entered via the front panel and stored in the battery backed-up RAM. The interface is capable of performing the following functional subsets: SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1 DT0, C0.

2-2.9 Data transfers between the processor and the interface chip are interrupt driven. The GPIB command mnemonics are fetched and interpreted, and the requested action is initiated.

2-3. POWER SUPPLY AND HEATSINK A1 (Figure 5-3)

2-3.1 The large filter capacitors (C1 through C5, C7, and C8), the bridge rectifiers (U20 through U24), transformers (T1 and T2), voltage selection jacks (J1 and J2), line filter (FL1), fuses (F1, Oscillator power, and F2, Main Power) and main power switch (S1) are mounted directly on the chassis. The Heatsink A1 contains standard three-terminal regulators (U1 through U11, U25, and U26) with setup resistors, decoupling capacitors, and fuses (F2 through F5).

2-3.2 The Power Supply and Heatsink A1 components form a switched section that powers most of the circuitry and an unswitched section that powers the heaters of the timebase and YIG oscillators.

2-3.3 The unswitched section receives power before the main line switch (S1) through fuse (F1) and internal voltage selector jack (J2) and plug (P2) to transformer (T2). The stepped down voltage at transformer (T2) is rectified by U23 and regulated by U9 and U10 to produce +24V and +15V oscillator power.

2-3.4 The switched section receives power through fuse (F2), line switch (S1), internal voltage selector jack (J1) and plug (P1) to transformer (T1). The stepped down voltage is rectified by U20 through U22 and U24. Regulators U1 through U8 and U25 provide the +5, −5, +8, +15, and −15 volts required by the printed circuit boards and microwave brackets. Regulators U11 and U26 provide +24 volts required by components in the instrument and the blower.

2-4. MICROPROCESSOR A2 PCB (Figure 5-5)

2-4.1 Timer U9 and inverter U11 (sheet 1 of 2) provide a power-on reset function for the microprocessor and its supporting circuitry. Switch SW1, which is not accessible from outside the instrument, provides a manual reset capability for troubleshooting purposes.

2-4.2 U1 is an 8-bit microprocessor circuit which is responsible for producing all the control data required by the instrument's signal-generating and signal-controlling circuitry. It converts level, frequency, and modulation data from the keyboard or IEEE interface into setpoint and control information required by the various printed circuit boards.

2-4.3 Device selection is controlled by three one-of-eight decoders (U2, U8, and U18). U2 selects the instrument specific and control software EPROMs

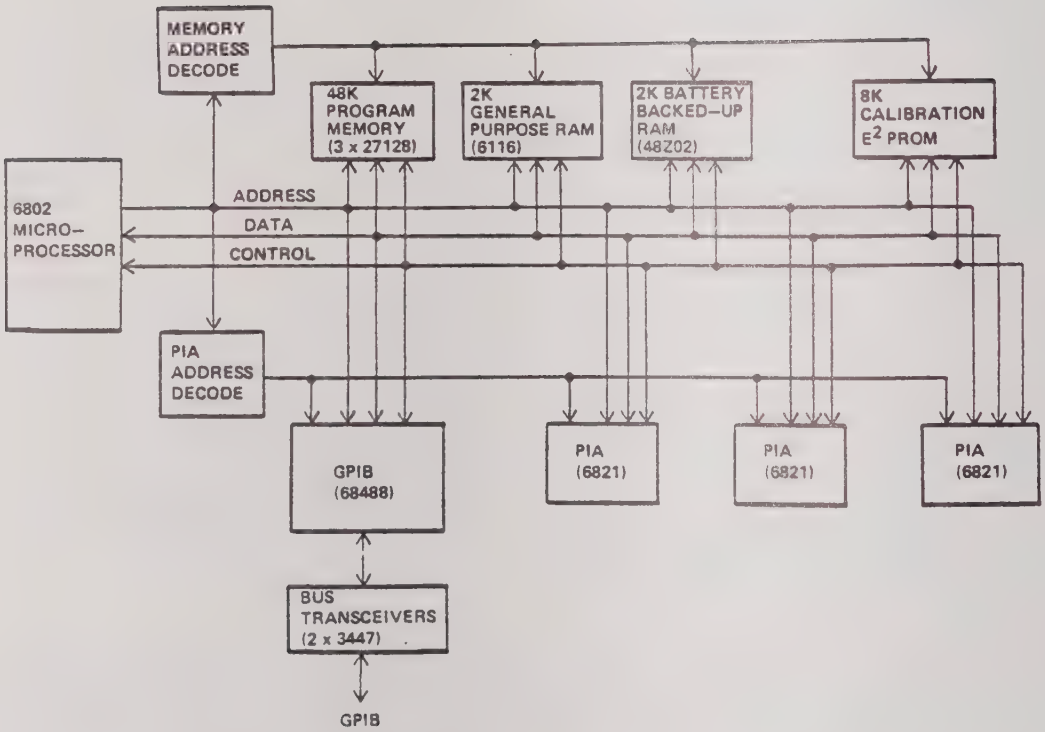

Figure 2-8. Microprocessor Board Block Diagram

U5, U6, and U7. U8 selects RAM devices U3 and U4 for storage of transient data. U18 selects U19, the battery powered EPROM that can be erased and written to by the microprocessor, for storage of the instrument character; i.e., which options are configured. U18 is also used to select the peripheral interface adapters (sheet 2 of 2) U12, Display and Keyboard; U13, internal status; and U14, analog-to-digital converter, analog multiplexer, and Discrete Fault Indicator; and U15, the IEEE interface controller.

2-4.4 U16 and U17 provide the interface circuit for the IEEE Bus.

2-5. AMPLITUDE CONTROL A3 PCB (Figure 5-7)

2-5.1 The detected RF power signal from the A35A1 PCB is received A3 PCB at relay K1 pin 6 (sheet 2 of 3). This signal from the internal detectors or a signal from an external detector is selected by K1, which is driven under microprocessor control and according to the rear panel ALC switch. The detected signal, whether internally or externally detected, is then sent to a sampling bridge consisting of Q1 through Q4, CR1 through CR4, and associated components. In the CW mode this can be considered to be a straight through path from K1 to U26. U27 buffers this signal, which is then fed through various sensitivity potentiometers to K4. K4 selects different gain resistors according to whether the instrument is in the pulse mode or CW mode to make up for different sensitivities of the detectors when being pulsed. K2 for CW and K3 for pulse select between high band (above 995 MHz) and low band (below 995 MHz) sensitivity setting resistors to compensate for the different sensitivities of the low band and the high band detectors.

2-5.2 The signal is then sent from K4 to U30 (sheet 3 of 3); a logarithmic amplifier, which converts the signal measured in volts, to dBm. This signal, which is now at a sensitivity of 100 mV/dBm, is sent to summing amplifier U33. At U33 three corrections are added to the detected signal. The first coming in from A6 PCB is a frequency-to-level correction, which compensates for the reduction in detector sensitivity with rising frequency, and is a ramp proportional to frequency.

2-5.3 The second signal, which is summed on to the detected voltage at U33, is level correction. This is a PROM generated correction signal which compensates for any changes or losses in the microwave path. The detected voltage will not correspond precisely to the output power. Therefore during calibration, the output is measured and compared to the programmed power and a correction factor for every step attenuator position at every 50 MHz is generated. The correction factor required, as defined by the frequency and the attenuator position commanded, is retrieved from the non-volatile PROM on A2 PCB and then added to the detected voltage enabling a very accurate specification on the level accuracy.

2-5.4 This corrected signal is sent from U33 pin 7 to U33 pin 2, which is another summing point. Another signal, the vernier level, which is set by the microprocessor under front panel or IEEE command, is summed to the corrected signal. When the loop is in its linear mode and the instrument is leveled, the loop amplifier U33 through drivers Q10 and Q11, which are the nip leveler drivers, will set the power level such that the corrected detected value at U33 pin 7 equals the vernier value as monitored at TP4. U33, the loop amplifier, has two FET switches Q8 and Q9 which alter the loop band width according to whether the instrument is in CW, AM, or Pulse mode. In AM the bandwidth is wide, enabling the level to follow the modulation. In CW the loop is narrowed to reduce noise. In Pulse the bandwidth is very small for sample-and-hold leveling. When the control signal from U33 goes outside the linear range, then U32, a level detector will change state and send an unleveled signal to the microprocessor on A2 PCB, which is continuously monitoring the status of this line and would at that point give an unleveled signal "ERROR 3". Also connected to U33 pin 7 is buffer U19 with zeroing and sensitivity potentiometers. U19 generates a signal level of 100 mV/10 dB step of measured power to A16 PCB. This signal enables the microprocessor to directly measure the detected power level for use in Special Function 10 which allows display of the measured detected power after correction.

2-5.5 The vernier level, as monitored at TP4, is generated by the microprocessor sending data bytes to latches U11 through U14 (sheet 1 of 3) then to digital-to-analog converter U10. U10 also generates the reference for U20 which distributes the 10 volt reference for use elsewhere on the A3 PCB. The vernier level output of U10 will be an analog voltage determined by the programmed power. This vernier level output is sent to U25 pin 9 (sheet 3 of 3). The sensitivity at this point is 1.5 volts for a programmed vernier level of +5 dBm for a standard instrument. From U25 the vernier level is scaled and any offset

cancelled (R82 — SM OS) through both parts of the buffer U24 to provide the vernier signal which is then summed with the detected voltage at U33 pin 2. Additionally connected to U24 pin 7 is a linearity optimization network, R126 and CR29. At high vernier levels the detector goes from its square law region into a more linear region and this leads to inaccuracies above about +5 dBm. For vernier levels above +5 dBm, R126 and CR29 modify the detected voltage to make the level control loop believe there is more power than the detected voltage would indicate. The loop then adjusts the output level to compensate for this, resulting in the desired output power. This is the third input at U33-6 summing point as mentioned in paragraph 2-5.2.

2-5.6 The PROM generated level correction is generated in a similar fashion to the vernier by the microprocessor through latches U11 through U14 into DAC U3 (sheet 1 of 3) and its associated buffer U4.

2-5.7 Amplitude modulation (AM) comes into U23 (sheet 3 of 3), which again is under microprocessor control through latch U11. The control logic turns on U23 relay, which connects front/rear panel AM input to the logarithmic amplifier U21. U21 converts the linear signal into a logarithmic signal in dBm suitable for directly adding to the vernier. This signal is summed in at U24 which is the vernier buffer. Therefore the amplitude modulation input is superimposed on the vernier and the amplitude control loop will then force the output level to track the AM input by making the detected voltage equal to the vernier at any time.

2-5.8 Additional switching is provided on A3 PCB for the FM using latch U14 and solid state relay U22. U22 is opened or closed to connect the FM front/rear panel input to the FM drivers on A5 PCB. U22 is an isolated integrated circuit on this board, merely routing the frequency modulation through A3 PCB because the drive for U22 comes from U14.

2-5.9 During pulse modulation the RF output is chopped, therefore the RF level is only available for level control during the time the RF is on. There is a sample and hold system on the amplitude control board. This samples the RF level approximately 30 ns after the RF pulse has been turned on for a duration of approximately 150 ns. This limits the minimum pulse width to about 200 ns. The pulse input is buffered by A23 PCB and received at U29 pin 1 (sheet 2 of 3) monostable. This monostable sets up the 30 ns delay before the sampling bridge opens. The second monostable U29 pin 9 sets up the sampling pulse width. This goes to the sampling bridge consisting of Q1 through Q4 and the associated diodes, resistors, and capacitors. When in the sample mode the bases of Q3 and Q2 are low and transistors Q1 and Q4 will be turned on. Because the anodes of CR4 and CR2 are more positive than the cathodes of CR1 and CR3, the diodes are turned on. Because of equal voltage drops over each diode, any signal appearing at the junction of CR2 and CR1 will be transferred directly through to the junction of CR3 and CR4. This is the sampling bridge in the sample condition; the detected signal from K1 is transferred straight through the U26 pin 2 and the holding capacitor C3. When monostable U29 pin 9 finishes its cycle, the sample signal goes low and the base of Q2 goes high, turning on Q2 and Q3, and the top end of the sampling bridge (junction of CR2 and CR4) is at a lower potential than the bottom end of the junction of CR1 and CR3. The diodes CR1 through CR4 are back-biased and have high impedance. The signal at K1 is no longer transferred to U26-3. The holding capacitor C3 therefore holds the previously sampled value, except for leakages. Any time after this point the RF pulse can fall to zero because the detected signal is no longer connected to the holding capacitor C3. The remainder of the amplitude control board now considers the RF level to still be that which generated the held voltage at C3, and so the level loop does not try to correct for the lack of detected voltage out of the video amplifier. Because of the slight difference in sensitivity of parts when undergoing pulse modulation, the setup resistors are duplicated for the pulse mode. These are selected by K4 going to its pulse mode position. As in the CW mode, there are duplicated resistors for the low band and high band to compensate for different low band and high band detector sensitivities.

2-5.10 U31, pins 7, 14, and 1 are controlled by the pulse mode logic. When in pulse mode, the input at U31 pin 6 is low, the sampling bridge is able to operate, and diodes CR14 and CR13 are back-biased. When in CW, the monostable U29 is held cleared and diodes CR13 and CR14 ensure that the sampling bridge is held in its sampling position; i.e., allowing the detected input straight through from K1 to U26 pin 3.

2-5.11 On A3, U6, U2, and U1 are buffers that take signals generated by the microprocessor through latches U11 through U14 to drive the attenuator. The attenuator is a latching attenuator which merely needs a signal level to select cells. There are two drive

lines to each cell (a plus and a minus) which will turn the cell on or off, respectively.

2-6. YIG OSCILLATOR AND YIG TUNED DRIVER A5 PCB (Figure 5-9)

2-6.1 A5 PCB provides the YIG oscillators and YIG tuned filters with tuning current using the tuning voltage provided by A6 PCB. Power FETs, Q10 and Q11, Q15 and Q16, Q18 and Q19 mounted in parallel convert the tuning voltage into current drive for the relevant oscillator. Series FETs Q12, Q13, Q14, Q17, and Q20 provide signal routing and signal selection according to the logic signals from the A6 PCB. Q12 and Q13 provide the sense current for the 0—2 GHz band and 8—18 GHz band respectively. Q14 and Q17 provide the +15 volt supply for the 8 to 18 GHz oscillator and 2 to 8 GHz oscillator respectively.

2-6.2 The YIG filter tuning is controlled by two signals, one proportional to the 100 MHz digits (1 volt/GHz) and the other to the 10 MHz and smaller digits (1 volt/100 MHz). When selected by the 0 to 8 GHz select signal via U5 pin 8 turning on Q21. The two signals are scaled and summed together with an offset for the low end setting by U2 and U3. The scaled voltage signal is converted by Power FET Q9 into the correct tune current for tuning the YIG filter which returns through sense resistor R37. The control loop adjusts the current through the filter and R37 to give 0 volts at the summing point U3 pin 2.

2-6.3 An FM input, on the front or rear panel, is selected for the 8 to 18 GHz band by U1. U1's selection is determined by the 8 to 18 GHz select signal. This FM input is fed through a push-pull buffer (Q5 and Q6) which is biased on by CR1 and CR2, a frequency compensation network (C4 and C5), and a sensitivity network (R72 and C6) to the 8 to 18 GHz FM coil.

2-6.4 Amplifier circuit Q1 and Q2 is driven by either the FM coil drive from A13 PCB or the fixed local oscillator error voltage as selected by U1. The FM coil drive from A13 PCB is used when the 8 to 18 GHz band is being modulated and the fixed local oscillator error voltage is used when in downconverter mode.

2-6.5 The FM drive for the 2 to 8 GHz band is direct from the FM signal at the front or rear panel through amplifier circuit Q7 and Q8 to the 2 to 8 GHz FM coil or it may be driven by the FM coil drive from A13 PCB via amplifier circuit Q3 and Q4.

2-6.6 Voltage regulator U4 is used to generate the low end tuning current for the YIG filter. Voltage regulators U6 and U7 provide +8 and −8 volts for the FM amplifier drivers.

2-7. OSCILLATOR DRIVER A6 PCB (Figure 5-11)

2-7.1 PROM U1 (sheet 1 of 2) receives and decodes the demultiplexed frequency data from A7 PCB. The decoded frequency data is used to drive level shifters Q1, Q5, Q9, and Q13. The level shifters determine which microwave relay 24-volt drive transistors (Q2, Q4, Q6, Q8, Q10, Q12, Q14, or Q16) will be turned on to select the correct routing of the microwave signal.

2-7.2 PROM U2 receives and decodes the demultiplexed frequency data from A7 PCB and processes it through Digital-to-Analog Converter (DAC) U4. This provides, in conjunction with a 10 MHz DAC signal from A7, an analog controlled voltage which is used to drive the main tune coils of the output oscillator. Test Point One (TP1) will be at 0 volts at the bottom end of the tuning range of each YIG. TP1 will then increase at 1 volt per GHz which means that at 7.9 GHz, for example, TP1 will be at 5.9 V since at 2 GHz, the bottom end of the oscillator, it was at 0 volts. The voltage at TP1 is then summed with a dc offset, from U19 pin 1 for the 2—8 GHz band or from U19 pin 7 for the 8—18 GHz band, to generate the tuning current. With TP1 at 0 volts at the bottom of the oscillator and then summing it with a dc offset means that the dc offset alone controls the tuning current at the bottom end of the oscillator. Because as the frequency is increased up to the top end of the oscillator the dc offset (the low frequency setpoint) doesn't change, the tuning current at the top end of the oscillator is governed by a scaling factor of the voltage at TP1. The summing point for the voltage at TP1 and the dc offset voltage is U16 pin 2 for the 2—8 GHz oscillator and U17 pin 2 for the 8—18 GHz oscillator. The voltage at TP1 is selected to go to either the 2—8 GHz summing point or the 8—18 GHz summing point by respectively turning on Q18 or Q17 with a signal from PROM U1 via U18. Only one is turned-on at any one time depending upon which frequency band is selected. The dc offset voltage for the low end of the oscillator is always connected to enable fast band changes.

2-7.3 A similar circuit (sheet 2 of 2) drives the reference oscillator. The frequency data received and decoded by PROM U3 from A7 PCB is processed by DAC U5 and its associated operational amplifier U7.

Level shifting is done on U7 and U8 in gain control leading to test point two (TP2) which will be set for 0 volts at the bottom end of the reference oscillator frequency range which is 2 GHz. The same scale factor of 1 volt per GHz leads to 5.7 V at the top end of the reference oscillator (7.602 GHz). A dc offset voltage from U20 pin 7 sets the reference oscillator's low end turning current. The voltage at TP2 and the dc offset voltage are summed together at U15 pin 2 to provide the tuning voltage for the reference oscillator.

2-7.4 Resistors R34 through R37, R44 through R47, R48 through R51, and R54 through R57 on sheet 1 and resistors R23 through R26 and R28 through R31 on sheet 2 are tuning chains. There are three fixed resistors in series in each tuning chain which may be jumpered. The expected value of tuning current that the YIG oscillator will require would leave the jumpers that are shown jumpered on the schematic intact and the jumpers which are shown are not jumpered (cut). These are set at test. The fixed resistors are much more stable than variable resistors and the bulk of the tuning uses these fixed resistors with only a smaller 2k variable resistor.

2-8. FREQUENCY CONTROL A7 PCB (Figure 5-13)

2-8.1 A7 PCB (sheet 1 of 2) receives the frequency address data generated by the microprocessor on A2 PCB at the demultiplexer U15 via one-half of the buffer U16. U15 demultiplexes the frequency address data into enable signals which are used to activate latches U1 through U13 for storage of the frequency data entering A7 PCB via the other half of buffer U16. From the latches U1 through U13 the frequency data is routed digit by digit (decade by decade) to the relevant band circuitry for frequency generation.

2-8.2 U20 and U21 are used by A7 PCB and Divide-by-N A10 PCB to provide the current divide by number for generation of A10 PCB's output frequency.

2-8.3 U24 is a 12-bit wide Digital-to-Analog Converter (DAC) requiring three bytes of frequency address data provided by U15 via inverter U25. U24, with its associated operational amplifier U17, converts the frequency data to analog levels to provide a sweep ramp to the rear panel. This sweep ramp will go from 0 volts at the start of the sweep to 10 volts at the end of the sweep in discrete steps each time the digital sweep steps to its next frequency. U22 ia a voltage reference buffer to provide the voltage reference for U24 DAC.

2-8.4 U18 (sheet 2 of 2) provides additional frequency decoding to generate further Divide-by-N data for A10 PCB and the logic levels to turn on one of the three oscillators on A10 PCB.

2-8.5 U19 DAC, again driven by frequency data from U5 and U13, provides an analog voltage corresponding to the frequency data selected on the 10^6 and 10^7 data lines. This analog voltage moves at 1 volt every 100 MHz and is used, in addition to other data on A6 PCB by A6 PCB for tuning the main tune coil.

2-8.6 U23 provides the voltage reference for both of the Digital-to-Analog Converters U19 and U24.

2-9. FIXED LOCAL OSCILLATOR PHASE-LOCKED LOOP A8 PCB (Figure 5-15)

2-9.1 A8 PCB receives a 5 MHz signal from A24 PCB at phase detector U2 pin 6. A second 5 MHz signal from A34A2 is inputted to U2 pin via amplifier U1. U2 compares the two signals to produce an error signal. U2 outputs this error signal for conversion to an error voltage by loop amplifiers U3 and U8. This error voltage is sent through solid state relay U6 pin when downconverter (Option 03) is selected, and out to the FM coil of the 6 to 18 GHz YIG oscillator on the A32 bracket.

2-9.2 Lock detector U4 connected across the outputs of U2 will detect any error pulses. U4 converts these pulses to a TTL level unlocked signal for the microprocessor on A2 PCB.

2-9.3 During downconversion, the main tune of the 6 to 18 GHz oscillator on A32 is driven by U7 and FET follower Q3. R38 allows adjustment of the current to tune the oscillator to 6.005 GHz.

2-9.4 When not in downconversion U6, driven by logic from A6, disconnects main tune and FM coils from A8. They are then driven by circuitry on A5 and A6.

2-10. DIVIDE-BY-N A10 PCB (Figure 5-17)

2-10.1 The A10 PCB consists of three oscillators: Oscillator No. 1, 90—150 MHz (Q1 and Q2), Oscillator No. 2, 150—250 MHz (Q5 and Q6), and Oscillator No. 3, 250—400 MHz (Q8 and Q9). The exact frequency that they are to oscillate at is defined by the microprocessor via Frequency Control A7 PCB, which generates the divide-by-N data, the 10^7 frequency digit, and the 10^6 frequency digit. The A7 PCB

generated data is directed into programmable dividers U5, U6, and U7.

2-10.2 The oscillators are in effect mixed, although only one of them will be on at any one time, at U10 pin 1. U10 drives decade divider U9 to give the output from A10 PCB. U10 also drives decade divider U8 which is controllable as a divide-by-10 or a divide-by-11. U8, operating in a prescaler fashion, enables the counting of the frequency up to 400 MHz. This count, used in conjunction with U1, U5, U6, and U7, provides the divide ratio so that the output of the oscillator turned on is divided down to 1 MHz. This 1 MHz signal is then compared at phase detector U3 with a 1 MHz timebase input. Any error is sent through loop amplifier U4 to generate a tuning voltage which then drives the oscillator control lines. The tuning voltage may be monitored at test point two (TP2).

2-10.3 Only one oscillator is turned on at any one time. The relevant oscillator is selected by transistor switches Q3, Q4, and Q7 with a signal from A7 PCB.

2-10.4 A lock detector U11 is connected across the phase detector output to detect pulses from the phase detector signifying an out-of-locked condition. U11, upon detection of this out-of-locked condition, generates a $\overline{\text{LOCK}}$ signal to the microprocessor.

2-10.5 Regulator U12 provides a 5-volt power supply to convert the output from U11, which is open collector, into a TTL signal suitable for reading by the microprocessor on A2 PCB.

2-11. RESOLUTION SYNTHESIZER A11 PCB (Option 03 1 kHz Resolution — Figure 5-19)

NOTE

The standard 0.1 Hz Resolution Synthesizer A11 PCB is not field repairable. Return this PCB to the factory.

2-11.1 The standard A11 PCB receives frequency data from A7 PCB and a 10 MHz reference input. The 10 MHz reference input is converted to a 2.3 MHz output where the digits less than 1 MHz correspond one to one to the digits programmed from the 100 kHz to 0.1 Hz positions.

2-11.2 Option 03 A11 PCB is a 1 kHz synthesizer. Frequency data from A7 PCB is connected to dividers U5, U6, and U7. Dividers U1, U5, U6, and U7 with NOR gate U2 govern the A11 PCB oscillation frequency to provide control from 1 MHz to 2 MHz.

2-11.3 The oscillator frequency which is between 100 and 200 MHz is divided down to give a 1 MHz signal which is presented to the phase detector U3 at pin 9. The phase detector compares this 1 MHz signal with the reference 1 MHz signal at U3 pin 6. This second 1 MHz signal is created by divide-by-10 U11 processing the 10 MHz timebase reference signal from A24 PCB.

2-11.4 U3 outputs the control voltage and any error signal through amplifier U4 to test point one (TP1) and the oscillator Q1 via inductor L2. A lock detector circuit U14 and U15 connected across the outputs of U2 will output an unlocked signal to A2 PCB should the oscillator not be locked to the timebase.

2-11.5 The oscillator output signal of 100 to 200 MHz is processed by two divide-by-10's U9 and U10 to form the 1 to 2 MHz A11 PCB output signal.

2-11.6 Switching is provided by transistors Q2, Q3, and Q4 with U13 to permit the connection of an external 1 to 2 MHz input signal to be used in place of the A11 PCB generated signal.

2-12. 100 MHz VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR A12 PCB (Figure 5-21)

2-12.1 Either an internal 10 MHz signal from the internal crystal oscillator reference timebase or an external signal inputted at the instrument's rear panel is selected by switching under microprocessor control. Relay K1 switches power to the internal oscillator. The operator may make the selection or allow the microprocessor to automatically select external upon an external reference signal being applied.

2-12.2 The selected reference signal forms one input to the phase detector U5. The other input is from the high-Q oscillator circuit based around the 100 MHz crystal Y1. This signal from the high-Q oscillator circuit is passed through divide-by-10 U3 to produce two 10 MHz signals. The phase detector U5 produces an error signal from the phase difference between one of the U13 10 MHz signals and the selected reference signal. This error signal is amplified by loop amplifier U4 and applied to the high-Q oscillator circuit as a control signal in a closed loop.

2-12.3 Connected to the control line from U4 is a window detector, comprised of U1 and U2. When the high-Q oscillator is not locked to the reference timebase (internal or external), the detector generates a low signal at pin T. This is read by the microprocessor, which indicates that the timebase is unlocked, displaying an "Error 12".

2-12.4 Two 100 MHz outputs are provided at pins B and C. Pin B output goes to Sampler Driver A19 PCB and pin C output goes to Sampler Drive A20 PCB if the downconverter (Option 01) is fitted. The second 10 MHz signal produced by U3 is outputted to Timebase Divider A24 PCB.

2-12.5 The microprocessor as part of the internal self-test routines, can inject a signal at pin F to intentionally unlock the circuit loop. This permits the microprocessor to verify that the correct status bit will be returned via pin T.

2-13. OUTPUT PHASE-LOCKED LOOP A13 PCB (Figure 5-23)

2-13.1 A13 PCB receives at connector J1 a 98 to 397 MHz signal for standard instruments or a 99 to 398 MHz signal for Option 03 instruments from mixer U1 on bracket A33. The signal is processed through amplifiers U1 through U4 which are part of an automatic level control loop with the gain controlled by pin diodes CR1 through CR3. The output of U4 goes to a peak detector consisting of CR4, CR5, and the associated biasing resistors into buffer amplifier U5. Buffer amplifier U5 compares the signal level at the output of the first section of U5 with a set reference level generated by R18. The difference if any is amplified through the second section of U5 and Q1 to give the control voltage driving the pin diodes. This control voltage will vary the signal level output of U4 to keep the automatic level control loop operating in its linear mode.

2-13.2 The output from U4, which is now leveled, goes to divide-by-10 U6. U6 receives the 98 to 397 MHz signal and produces a 9.8 to 39.7 MHz signal. U6 output signal and A10 PCB output signal are compared by phase detector U17 to produce an error signal. This error signal is sent through amplifier U8 to produce the control voltage to drive the YIG oscillator frequency modulation coils via the frequency modulation drivers on A5 PCB.

2-13.3 The error signal outputted by phase detector U17 is monitored by lock detector U9. U9, with +5 volt power supply U11 will convert any error pulses to a TTL level out-of-lock signal for the A2 PCB.

2-14. REFERENCE PHASE-LOCKED LOOP A14 PCB (Standard Instruments — Figure 5-25/Option 03 Instruments — Figure 5-27)

NOTE

The circuit description for the standard and Option 03 instruments is the same, except as noted.

2-14.1 A14 PCB contains a standard phase-locked loop operating at an intermediate frequency of 2—3 MHz for standard instruments or 1—2 MHz for Option 03 instruments. A14 PCB receives a signal from Sampler A2 on A33 bracket at phase detector U2 on pin 9 via amplifier U1, 100 MHz trap C2 and L2, and A14 PCB input connector J1. U2 compares the signal at pin 9 with a reference signal from A11 PCB via programmable divider U6 presented to U2 pin 6.

2-14.2 U6 is a two-position, divide-by-one or divide-by-three, programmable divider. Divide-by-one position is used when the instrument frequency is 0 to 8 GHz and divide-by-three position is used when the instrument frequency is above 8 GHz. The control logic to set the correct position is provided by A6 PCB.

2-14.3 U6, when set to the divide-by-three position, will divide the reference frequency from A11 PCB down to 660 kHz to 1 MHz for standard instruments or 330 kHz to 660 kHz for Option 03 (1 kHz resolution) instruments. Consequently the signal arriving from sampler A2 on the A33 bracket will also be reduced to one-third. The purpose of this divide-by-three is that in the 8 to 18 GHz band, the reference oscillator is used at one-third of the fundamental frequency. The A11 PCB reference signal will therefore be multiplied by three before being added to the synthesizers output frequency.

2-14.4 The reference signal produced by U6 is sent to phase detector U2 pin 6. This reference signal is compared to the signal at U2 pin 9. U2 generates an error signal to loop amplifier U3 for conversion to an error voltage or control voltage which should nominally be 0 volts. This control voltage is amplified by FM drivers Q3 and Q4 to drive the FM coil on the reference oscillator.

2-14.5 Lock detector U4 is connected across the outputs of phase detector U2. U4 will detect any error

pulses and convert them to a TTL level unlocked signal for the microprocessor on A2 PCB which generates an "Error 14" message.

2-15. DISPLAY INTERFACE A15 PCB AND DISPLAY A15A1 PCB (Figure 5-30)

2-15.1 A15 PCB and A15A1 PCB are controlled by bus from the A2 PCB. The A15 PCB receives the data entry from the pushbutton switches at decoders, base ten to binary coded decimal, U1 through U5. U1 through U5, in conjunction with decoder U6, enable the switch address to be placed on the bus via latch U9.

2-15.2 Monostable U7, driven by the group select signal from U6, generates an interrupt signal to the microprocessor on A2 PCB when any switch is depressed. The interrupt signal is delayed by U7 to allow for switch bounce.

2-15.3 The series of flip-flops in U10 receive the pulses generated by the spinwheel and reduce the sensitivity of the spin wheel to approximately 20 pulses per revolution at U10-15. Pin 2 of U10 defines the spinwheel direction. Data is placed on the bus via U9. When in the edit mode, the microprocessor monitors U10-15 for indication of spinwheel activity, and if set, reads U10-2 for UP/DOWN information.

2-15.4 LED driver U16 drives in a multiplexed fashion all of the lighted pushbutton switches and digit number 16 which is the ±1 for the power display. The digit drives are paralleled to enable about 15 mA of current to pass through them (digit 0 through 2 and 3 through 5). The remaining digit displays are directly controlled via the bus by the microprocessor, including all the letters for error codes, for setting up special functions, the decimal point, and blanking (which corresponds to data "F" being sent). Digit selection is achieved by U12 with data sent to all digits in parallel form via connector J2.

2-16. ANALOG-TO-DIGITAL AND MULTIPLEXER A16 PCB (Figure 5-32)

2-16.1 The Frequency Modulation and Amplitude Modulation inputs are passed through a precise peak detector consisting of U7 and U1. The frequency response of U7 and U1 exceeds the frequency response specified for the modulation inputs.

2-16.2 Multiplexer U2 selects between the modulation inputs or a detected power level signal on A16 PCB pin 2 from A3 PCB. U2 routes the selected signal to Analog-to-Digital converter U3 under microprocessor control from A2 PCB.

2-16.3 U3 converts the selected signal into a strobed binary coded decimal signal suitable for reading by the microprocessor.

2-16.4 Voltage regulator U6 provides an accurate two-volt reference for U3 operation. U4 and U5 are five-volt regulators providing power to A16 PCB circuitry.

2-17. SAMPLER DRIVER A19/A20 PCB (Figure 5-34)

2-17.1 Sampler Driver A19 PCB is driven by a 100 MHz signal from A12 PCB. The signal enters at J1 and goes through Y1, a 100 MHz crystal, to remove any sidebands. The signal is amplified by a tuned amplifier consisting of Q1 and Q2. The amplified signal is outputted at J2 at a level of approximately +20 dBm and goes to drive sampler on the A33 reference oscillator bracket. Capacitors C6 and C9 are used to peak the response of the tuned amplifier at 100 MHz for maximum gain.

2-17.2 Sampler Driver A20 PCB is present only if Option 01, extended low frequency output (Downconverter Bracket A34), is fitted to the instrument. Operation of A20 PCB is identical to A19 PCB with the amplified signal outputted to drive the sampler on the A34 downconverter bracket.

2-18. PULSE MODULATOR DRIVER A23 PCB (Standard/Option 56002 — Figure 5-37)

2-18.1 A23 PCB (sheet 1 of 2) receives the pulse input at buffer/inverter U1 pins 9 and 11. Buffer/inverter U1 output pin 10 sends the pulse input to operate the sample and hold bridge on A3 PCB. U1 output pin 8 sends the pulse input to three paired monostable delays U5, U6, or U7. Each monostable delay pair contains one positive edge triggered monostable and one negative edge triggered monostable. The respective monostable delays correspond to ON and OFF pulses.

2-18.2 Only one monostable pair will be active. The active pair is dependent upon the frequency band chosen: 0—2 GHz, 2—8 GHz, or 8—26 GHz. The active monostable pair is chosen by the control signals on A23 PCB pins 5 and 8 as processed by U3 and U4 and portions of buffer/inverters U1 and U2. The processed control signals enable the tristate buffers U9 and U10 as appropriate.

2-18.3 The ON and OFF pulses are sent by the active monostable pair to another monostable pair U11. U11 pin 1 is the ON signal and U11 pin 9 is the OFF signal. This monostable pair drives U12 pins 1 and 2 which are the inputs to a set/reset latch. The set/reset latch generates a signal at U12 pin 4 corresponding to a delayed pulse which will be the same pulse width as the original pulse. Monostable delays U5, U6, and U7 set up the delay relative to the pulse input. This delay is to enable correct timing on the A3 PCB sample and hold bridge.

2-18.4 The delays on U5, U6, and U7 are set up individually at factory testing for each band to compensate for different propagation delays in each band. Also this individual setup enables a 300 nanosecond delay from the pulse input to the RF output regardless of which band is used to simplify programming for automated test equipment systems.

2-18.5 The signal at U12 pin 4 then goes through the remainder of U12 which acts as buffers to the pulse modulator drivers. These pulse modulator drivers (sheet 2 of 2) are discrete transistor drivers. These drivers connect directly to the pulse modulators which are capable of giving at least 80 dB ON/OFF ratio.

2-18.6 A logic signal from A3 PCB received at U2 pin 9 ensures that when not in pulse mode, the pulse modulators will not be set to their attenuating state.

2-18.7 Voltage regulators U13 and U14 (sheet 1 of 2) provide the pulse modulator transistor drivers (sheet 2 of 2) with the +8 and −8 volts required.

2-18.8 Transistors Q7 and Q8 form a switch driven by the downconverter logic signal on A23 PCB pin 5 (sheet 1 of 2). This transistor switch is used to provide power to A20 Sampler Driver PCB when in downconverter mode.

2-19. TIMEBASE DIVIDER A24 PCB (Figure 5-39)

2-19.1 The A12 PCB outputs a 10 MHz signal to one section of buffer U4, which is then distributed for internal use. The 10 MHz signal is also buffered by two other sections of U4 in parallel, and then sent to the rear panel timebase output. The signal is also processed by divide-by-10 and divide-by-2 U2 to produce a 1 MHz and a 5 MHz output for internal use. The 1 MHz signal produced also is fed to divide-by-10 U3 to produce a 100 kHz output for internal use.

2-19.2 Voltage regulator U1 produces a regulated +5 volt supply for U2 through U4.

2-20. 2—8 GHz OUTPUT BRACKET A31 (Figure 5-40)

2-20.1 The 2—8 GHz YIG oscillator Y1, driven by A5 PCB, sends the selected RF signal through a pad and amplifier A1, which together perform the function of an isolator to coupler/leveler A2. The isolation is required because the YIG oscillator frequency could change somewhat (pulling) with the changing load according to the leveler and modulators operating points. The selected signal is sent from coupler/leveler A2 to pulse modulator A3, controlled by A23 PCB, which in turn is followed by high-powered amplifier A4 outputting the signal at approximately +20 dBm at limiting. The amplified signal is sent to YIG tuned filter Y2 to remove the harmonics caused by amplifier A4. YIG tuned filter Y2 is tuned by A5 PCB in a manner similar to the main tune of the 2—8 GHz YIG oscillator. Filter Y2 tracks the oscillator with a bandwidth of approximately 30 MHz. The output of the filter A2 is the 2—8 GHz fundamental output. The coupled output of A2 is used to monitor the frequency, to enable frequency locking.

2-20.2 The 2—8 GHz YIG oscillator Y1 is also used to provide the 6—8 GHz input to Downconverter Bracket A34 (Option 01). The 6—8 GHz output from A31 is connected to bracket A34 is via relay K1. The 0—2 GHz output from bracket A34 is returned to relay K2. Relay K2 determines which signal, the 0—2 GHz downconverter or the 2—8 GHz signal is selected to be sent to output selection relay K4 on 8—18 GHz Output Bracket A32.

2-21. 8—18 GHz OUTPUT BRACKET A32 (Figure 5-41)

2-21.1 The 6—18 GHz YIG oscillator is driven by A5 PCB. The signal is sent through isolator U1 to relay K1. During downconversion, the 6—18 GHz YIG oscillator is used as a fixed local oscillator providing a 6.005 GHz signal to the Downconverter (Option 01) via K1. Relay K1 sends the generated signal to module A1 which provides a coupled output (for frequency locking), leveling and pulse modulation. From this module the generated signal is amplified by high-powered amplifier A2 and sent to relay K2. Relays K2 and K3 select filter FL1 (12 GHz) or FL2 (18 GHz) for removal of harmonics.

2-21.2 From relay K3, the signal is passed to output selection relay K4, which selects either the 8—18 GHz signal generated by the A32 bracket or the 0—8 GHz signal from the A31 bracket.

2-22. 2—8 GHz REFERENCE BRACKET A33 (Figure 5-42)

2-22.1 Power combiner A2 takes the coupled outputs from coupler/leveler A2 on bracket A31 and coupler/leveler/pulse modulator A1 on bracket A32 and combines them into one signal which is passed to mixer U1. Mixer U1 mixes the signal from power combiner A1 with the signal generated by the 2—8 GHz Reference Oscillator Y1 which passes through coupler A1 and a pad. The output from the mixer is the intermediate frequency for the Output Phase-Locked Loop A13 PCB.

2-22.2 Coupler A1 passes the signal generated by Y1 to sampler A3 which is also driven by 100 MHz from A19 PCB. Sampler A3 generates harmonics of the 100 MHz input, which then mix internally with the 2—8 GHz. This effectively enables a lower frequency phase-locked loop, Reference Phase-Locked Loop A14 PCB, to drive the tuning currents for Y1 to lock between 2 GHz and 8 GHz.

2-23. DOWNCONVERTER BRACKET A34 (Extended Low Frequency Output Option 01 — Figure 5-43)

2-23.1 The Downconverter Bracket A34 receives the 6.005 GHz signal from bracket A32 through coupler A1. The coupler feeds the 6.005 GHz signal through a pad to sampler A2, which is driven by 100 MHz from A20 PCB. The sampler outputs a difference frequency of 5 MHz to Fixed Local Oscillator A8 PCB which then drives the tuning of the 6—18 GHz oscillator on bracket A32, closing the loop.

2-23.2 This fixed local oscillator signal of 6.005 GHz is fed from coupler A1 through a pad to mixer U1. Mixer U1 mixes this 6.005 GHz signal with the 6—8 GHz output from bracket A31. The output signal from mixer U1 is level controlled and goes through 2 GHz low-pass filter FL1 to remove any LO or RF bleedthrough and the upper sideband signals leaving a 0—2 GHz signal equal to the difference between the 6.005 GHz fixed local oscillator frequency and the output from the 2—8 GHz A31 bracket.

2-23.3 The difference signal is fed to high-power amplifier U2 operating from 10 MHz to 2 GHz, then through a 2 GHz filter to remove harmonics to coupler U4. A detector is mounted on U4 for level control which connects to A35A1 PCB then on to A3 PCB which controls the level of the 6—18 GHz signal.

2-23.4 From coupler U4 the 0—2 GHz difference signal goes to relay K1 on bracket A31 which selects between the downconverter signal or the 2—8 GHz signal on bracket A31. From relay K1 the selected signal goes to relay K4 on bracket A32, which routes the signal to the output bracket A35.

2-24. OUTPUT BRACKET A35 (Front — Figure 5-44/Rear — Figure 5-45)

2-24.1 Output Bracket A35 (front or rear) consists of a directional detector which monitors the output power for use in leveling between 995 MHz and 26.5 GHz and Video Amplifier A35A1 which amplifies the detected signal. Refer to paragraph 2-25 for description of A35A1 PCB.

2-25. VIDEO AMPLIFIER A35A1 PCB (Figure 5-47)

2-25.1 One detector is mounted on the Downconverter Bracket A34 (Option 01, if present) monitoring the output power between 10 MHz and 995 MHz. One detector is mounted on the Output Bracket A35 monitoring the output power between 995 MHz and 26.5 GHz. These detectors supply RF to A35A1 PCB. The detected RF enters via J1, from the Downconverter A34, and via J2, from the Output Bracket A35. The respective RF signals are amplified by U4, low band, and U3, high band. U3 and U4 are identical high-speed video amplifiers capable of passing the pulse edges generated during pulse modulation.

2-25.2 Amplifier selection is performed by relay K1 which is driven by a 0—995 MHz logic signal. Regulators U1 and U2 provide the required +6 volts and −6 volts for the video amplifiers. The circuitry around the amplifiers provides for accurate offset nulling for accurate measurement of low power levels.

CHAPTER 3

MAINTENANCE

3-1. INTRODUCTION

3-1.1 This chapter contains procedures to maintain the operating characteristics and specifications of the 1700 Series Microwave Synthesizer.

3-2. SAFETY PRACTICES

3-2.1 Under no circumstances should any person service or adjust equipment unless in the presence of another person who is capable of rendering first aid/resuscitation services in the event of an accident.

3-2.2 Prior to applying power to the 1700 Series instrument, determine that the internal protective power ground is connected to the protective ground conductor of the power cord. This ground, in turn, must be connected through the external power cord to a grounded power outlet. Verify ground continuity from the chassis through the power cord using an ohmmeter, with power totally removed from the instrument. Whenever it is determined that the protective ground system has been impaired, the equipment must be made inoperative or be secured against inadvertent operation until the deficiency is corrected.

3-2.3 Troubleshooting, repair, or adjustments of the 1700 Series Microwave Synthesizer with power applied to the circuits and top cover removed should be performed only by skilled technical personnel who are aware of the various hazards involved.

3-2.4 Under certain conditions, dangerous potentials may still exist when power is removed from the instrument due to charges retained by capacitors. To avoid injury, always remove power; then wait for several seconds prior to replacing components or making repairs.

3-2.5 To avoid potential damage to the 1700 Series instrument always turn off power for several seconds before removing or installing any circuit boards and/or discrete components.

3-3. RECOMMENDED TEST EQUIPMENT

3-3.1 Table 3-1 is a list of recommended test equipment. Equipment of equivalent or higher specifications may be substituted.

Table 3-1. Recommended Test Equipment

Type	Model
Digital Voltmeter, 6-1/2 digit (100 uV resolution on 10 V range)	SD 7362
Spectrum Analyzer, 18 GHz (18 GHz, minimum)	HP 8566A
Power Supply	Variac W5MT3VM
Test Oscillator (10 Hz — 10 MHz, 50 and 600 ohm outputs)	HP 652A
Pulse Generator (Rate to 100 kHz. Width 100 ns to 10 ms, level 5 V into 50 ohm.)	SD 101
Microwave Counter (FM discriminator)	SD 6054B
Counter	SD 6100
Power Meter, 18 GHz (0.1 dB resolution)	HP 436A
Modulation Meter (200 kHz AM bandwidth)	Boonton 82AD
Oscilloscope, 250 MHz (250 MHz bandwidth)	Tektronics 475A

3-4. TROUBLESHOOTING

3-4.1 The information contained in the following paragraphs is designed to assist an experienced technician locate an instrument fault at the module level. The technician can then repair the module using the information in Chapter 2, Theory of Operation, and the module schematics in Chapter 5, Drawings.

3-4.2 Power-Up Faults. Table 3-2 contains failure symptoms for the instrument that could occur at power-up and a possible corrective action.

Table 3-2. Power-Up Faults

Symptom	Action
1. No power	1. Check AC fuse. Replace as necessary. 2. Check AC power cord for continuity. 3. Check AC power outlet.
2. No fan	1. Check items 1 thru 3 of symptom number 1. 2. Check internal AC Voltage Selection Plugs. 3. Check Power Supply A1 Heatsink Assembly.
3. No front panel display or random segments lighted.	1. Check items 1 thru 3 of Symptom number 1. 2. Check printed circuit boards for proper seating. 3. Check internal connectors for tightness. 4. Check Power Supply A1 Heatsink Assembly.

3-4.3 Instrument Error Codes. The 1700 Series uses internal diagnostics to verify correct operation. Should the internal diagnostics detect an error, an error code will be displayed in the modulation display. This error code will consist of the letter "E" and a two-digit number. The number relates to the assembly generating the error. See table 3-3 for a listing of error code versus assembly. When in remote operation, the error messages are outputted on the GPIB. See table 3-4 for a listing of the error codes as outputted on the GPIB.

Table 3-3. 1700 Series Error Codes Versus Assemblies

1700 Series Error Code	Associated Assembly	Error Description
E2.0	A2	RAM failure U3, U4
E2.1	A2	PROM failure U5, U6, U7
E2.2	A2	EEPROM failure U19
E2.3	A2	Timer failure U10
E3	A3	Unleveled
E8	A8	Fixed Local Oscillator Unlocked (Downconverter only)
E10	A10	Divide-by-N unlocked
E11	A11	Reference Synthesizer unlocked (Option 03 only)
E12	A12	Timebase VCXO unlocked (See note)
E13	A13	Output PLL unlocked
E14	A14	Reference PLL unlocked
E16	A16	Multiplexer/DVM error

NOTE: E12 will occur when Timebase Oscillator is cold and therefore off-frequency. It will also occur if an off-frequency external timebase is applied. These do not indicate an instrument malfunction.

Table 3-4. Listing of Error Messages Outputted by 1700 Series on GPIB

F07RSY00 (DEV):
A10 DIVIDE BY N UNLOCKED <cr> <lf>
F07RSY00 (DEV):
A11 REFERENCE SYNTH.
UNLOCKED <cr> <lf>
F07RSY00 (DEV):
A12 TIME BASE VCXO
UNLOCKED <cr> <lf>
F07RSY00 (DEV):
A13 OUTPUT PLL UNLOCKED <cr> <lf>
F07RSY00 (DEV):
A14 REFERENCE PLL
UNLOCKED <cr> <lf>
F07RSY00 (DEV):
A3 OUTPUT UNLEVELED <cr> <lf>
F07RSY00 (DEV):
A8 FIXED L.O. PLL UNLOCKED <cr> <lf>
F07RSY00 (DEV):
EXT. TIME BASE REF.
NOT PRESENT <cr> <lf>
F07RSY00 (DEV):
A2 RAM FAILURE <cr> <lf>
F07RSY00 (DEV):
A2 PROM FAILURE <cr> <lf>
F07RSY00 (DEV):
A2 EEPROM FAILURE <cr> <lf>
F07RSY00 (DEV):
A2 TIMER FAILURE <cr> <lf>
F07RSY00 (DEV):
A16 ANALOG TO DIGITAL
CONV. FAIL <cr> <lf>
F07RSY00 (DEV):
CONFIDENCE CHECK FAILURE <cr> <lf>
F07RSY00 (DEV):
INTERNAL SELF TEST # test
no. <cr> <lf>

3-5. PERFORMANCE VERIFICATION TEST

3-5.1 The Performance Verification Test is a group of tests designed to assist the service technician in verifying that the 1700 Series instrument is performing within the specifications listed in Chapter 1. The Performance Verification Test should be performed upon receipt of an instrument, after repair, or when the performance of the instrument is suspect. Refer to table 3-1 for the list of recommended test equipment. Should the instrument fail any part of the Performance Verification Test and no error codes are displayed in the MODULATION Display, it is recommended that a complete calibration of the instrument be accomplished. Refer to paragraph 3-6 for calibration procedure.

NOTE

The Unit Under Test (UUT) should be allowed to warm up for a minimum of thirty (30) minutes to obtain correct operating temperature prior to performing the test. Should the UUT not be at proper operating temperature, the complete test or a portion of the test may be invalid.

3-5.2 Lock Test. Select frequency within the range of the unit, at a level of 0 dBm, and verify on the counter that the output is locked (synchronize the timebases).

3-5.3 Level Test. At various frequencies select levels within a measurable range according to the available power meter, and verify a level accuracy of ±1 dB at powers above −60 dBm.

3-5.4 Frequency Modulation Deviation Test.

1. Connect the test oscillator (HP 652A) 50 ohm output, using a tee connector, to the UUT's MODULATION - FM input connector and to the oscilloscope (TEK 475A) input.

2. Connect the spectrum analyzer (HP 8566A) to the UUT's RF OUT connection.

3. Set the test oscillator to 181.8 kHz with an amplitude of 0 V peak-to-peak.

4. Set the spectrum analyzer scan width to 100 kHz/cm and the UUT output to 6 GHz at 0 dBm. Ensure that RF is turned on.

5. Press UUT's Modulation [FM] pushbutton (LED will light).

6. While observing the carrier on the spectrum analyzer, slowly increase the test oscillator's signal amplitude.

7. Verify the test oscillator's amplitude output on the oscillator to be 2 ±0.2 V peak-to-peak, when the carrier dips to its second null point on the spectrum analyzer, typically.

8. Repeat test for a UUT output frequency of 12 GHz.

3-5.5 Frequency Modulation Bandwidth Test.

1. Connect the UUT's RF OUT connector to the discriminator's (6054B) HF input.

2. Connect discriminator output to the oscilloscope's (TEK 475A) Channel B input.

3. Connect the test oscillator's (HP 652A) 50 ohm output to the UUT's MODULATION - FM input.

4. Set the discriminator to NORMAL and 1 kHz resolution.

5. Set the test oscillator to 181.8 kHz with an amplitude of 2V peak-to-peak.

6. Set oscilloscope to Channel B and adjust vertical volts/div for 4 divisions peak-to-peak.

7. Set UUT for 6 GHz at approximately 0 dBm.

8. Press MODULATION [FM] pushbutton (LED will light).

NOTE

Test oscillator output amplitude changes when frequency is changed which will cause Channel B signal amplitude to change.

9. Vary the test oscillator frequency from 50 kHz to 1 MHz and verify that Channel B signal and amplitude remains between 2 divisions peak-to-peak and 8 divisions peak-to-peak (3 dB points).

10. Repeat test for a UUT output frequency of 12 GHz.

3-5.6 Amplitude Modulation Test.

1. Connect the test oscillator's (HP 652A) 600 ohm output, using a tee connector, to the UUT's MODULATION - AM input connector and to the oscilloscope's (TEK 475A) input.

2. Connect the spectrum analyzer (HP 8566A) to the UUT's RF OUT connector.

3. Connect the spectrum analyzer's rear panel 21.4 MHz output to the modulation meter (BOONTON 82AD).

4. Set the UUT's output at 6 GHz at +4 dBm (or −3 dBm if Option 12, +3 dBm output power, is fitted on UUT).

5. Set the spectrum analyzer to 100 kHz/cm.

6. Set the modulation meter for AM, 100% PP/2, 10 Hz LOW LIMIT, 200 kHz HI LIMIT, and AUTO LEVEL.

7. Locate the signal on the spectrum analyzer's screen.

8. Switch the spectrum analyzer to ZERO SPAN, LINEAR, MAX IF BANDWIDTH and center the frequency precisely.

9. Press the UUT's MODULATION [AM] pushbutton (LED will light).

10. Set the test oscillator to 10 kHz at 1.8 V peak-to-peak. Verify that the modulation meter indicates 85—95% modulation, typically.

11. Reset the test oscillator to 10 kHz at 1.6 V peak-to-peak. Verify that the modulation meter indicates 75—85% modulation, typically.

12. Reset the test oscillator to 10 kHz at 1.0 V peak-to-peak. Verify that the modulation meter indicates 45—55% modulation, typically.

13. Reset the test oscillator to 10 kHz at 0.6 V peak-to-peak. Verify that the modulation meter indicates 25—35% modulation, typically.

14. Set the test oscillator to 10 kHz at an output level which will indicate 50% modulation on the modulation meter.

15. Verify that the modulation meter indicates within the range of $\geq 35\%$ to $\leq 65\%$, while varying the test oscillator from 100 Hz to 50 kHz.

16. Repeat test at a UUT frequency of 12 GHz and, if extended low frequency output (Option 01) is fitted, at 1 GHz.

3-5.7 Pulse Modulation Test.

1. Connect the spectrum analyzer (HP 8566A) to the UUT's RF OUT connector.

2. With the MODULATION - [FM] and - [AM] pushbuttons off (not lit), set the UUT's output frequency to 6 GHz at 0 dBm output level.

3. Establish a reference level on the spectrum analyzer while narrowing the bandwidth down to zero span. Ensure the tuning is peaked.

4. Apply a TTL-level, 100 Hz 5 ms pulses to the pulse modulation input.

5. Press MODULATION [PULSE] pushbutton (LED will light).

6. Triggering the spectrum analyzer from the video input, verify an ON-OFF ratio of ≥ 80 dB.

NOTE

To improve the dynamic range of the spectrum analyzer, reduce the input attenuation to measure the RF OFF level.

7. Repeat procedure with the UUT's output at 12 GHz.

3-5.8 Spurious Test.

NOTE

Measurements at each frequency should be made without readjustment of spectrum analyzer controls, including the analyzer input attenuator.

1. Set the UUT as follows:

RF OUT	ON
AM	OFF
FM	OFF
PULSE	OFF
ALC	INT
LEVEL	0 dBm
FREQUENCY	6 GHz

2. Connect spectrum analyzer (HP 8566A) to the UUT's RF OUT connector.

3. Set the spectrum analyzer scan width to 100 MHz/cm.

4. Maintaining the carrier at center band, note and measure any discrete spurious or large noise peaks while decreasing the spectrum analyzer scan width in steps to 20 kHz/cm. Spurious response should be ≤ −50 dBc.

5. Repeat steps 1 through 4 for a frequency of 12 GHz. Spurious responses should remain ≤ −50 dBc.

6. If downconverter (Option 01) is installed, do steps 1 through 4 for a frequency of 1 GHz. Spurious responses should remain ≤ −50 dBc.

3-5.9 Step Attenuator Test (If applicable).

NOTE

Step attenuator testing may be limited by the measurement system. A low power head may be used on a HP 436A power meter to measure down to approximately −65 dBm, or a tuned RF meter, e.g. HP 8902A, may be used to measure down to approximately −127 dBm, but only below a frequency of 1.3 GHz. With limited accuracy a good Spectrum Analyzer can check the attenuator functionally down to about −80 dBm, but will be less accurate than the UUT.

1. Connect UUT and test equipment.

2. Set UUT output frequency to 2 GHz and 0 dBm output level.

3. Set Spectrum Analyzer as follows:

Center Frequency	2.100 MHz
Signal Peak	Reference Line
Sweep	Manual
Span	0 Hz
Marker Offset	ON

4. Verify level is 0 dBm ±1 dB. Zero the offset marker.

5. Set UUT output level to −10 dBm and verify marker level indication of −10.0 dB ±1 dB.

6. Repeat step 5 for UUT output levels of −20, −30, −40, −50, and −60 dBm. Verify level indication is within ±1 dB.

7. Measurement of levels below −60 dBm may be attempted, but accuracy is likely to be limited by the test system in use.

3-5.10 Linearity Test.

NOTE

The Linearity Test checks the accuracy of the vernier calibration.

1. Set UUT output power to 0 dBm, then the attenuator range hold (Special Functions 30 and 31; refer to operator's manual).

2. Set UUT output frequency for 2 GHz.

3. Verify the measured output power is within ±1 dB of commanded power from:

   −5 dBm to +10 dBm for Standard (+10 dBm) instruments

   −7 dBm to +3 dBm for instruments fitted with Option 12 (+3 dBm output power).

4. If extended low frequency output (Option 01) is fitted, repeat step 3 for a UUT output frequency of 500 MHz.

3-5.11 This completes the performance verification test. Remove power from all test equipment and UUT. Disconnect all cables.

3-6. CALIBRATION. The following paragraphs contain the calibration procedures for the 1700 Series Synthesizer. These procedures are designed for skilled personnel who are qualified and experienced in the calibration of electronic test equipment, and who are aware of the various hazards involved with microwave equipment. Prior to performing any of the following procedures refer to Chapter 2, Theory of Operation, and paragraphs 3-2, Safety Practices, and 3-3 Recommended Test Equipment. Refer to figure 5-1 for printed circuit board assembly location.

NOTE

This procedure assumes a functional unit.

If unit has non-calibration problems or cannot be calibrated using this procedure refer to factory personnel for component selection and details of component change interactions.

Parts replacement may require selection of associated components. If a repair has been performed and calibration appears invalid, refer to factory personnel for component selection and details of component change interactions.

3-6.1 Frequency Control Printed Circuit Board (PCB) Assembly A7 (Figure 5-12).

1. Press [FREQ] and [STOP] pushbutton. Adjust A7R10 to give 10.00 V at SWEEP OUT B.N.C. connector (rear panel).

2. Enter 2.099 GHz. Adjust A7R11 for 0.99 V at TP1.

3-6.2 2—8 GHz Reference Oscillator Bracket A33 (Figure 5-42).

NOTE

As part of calibration of 2—8 GHz Reference Oscillator Bracket A33, the following assemblies will also be calibrated:

1 kHz Resolution Synthesizer PCB Assembly A11 (Option 03) (figure 5-18)

100 MHz VCXO PCB Assembly A12 (figure 5-20)

Reference Phase-Locked Loop PCB Assembly A14 (figure 5-24, Standard or figure 5-26, Option 03)

Sampler Driver PCB Assembly A19 (figure 5-33)

1. Verify A12TP1 is between 3.5 V and 7.5 V; if necessary, adjust A12C13. Verify that the error code E12 is not indicated in the MODULATION display, proving A12 is locked.

CAUTION

Adjustments are interactive and may be affected by the proximity of the trimming tool.

2. Monitor the 100 MHz output from A19. Trim A19 capacitors C6 and C9 for a maximum output signal. Level must be at least 4 V peak-to-peak when loaded by the A33 sampler module A3.

NOTE

For instruments with 0.1 Hz resolution, the A11 PCB Assembly is the D.D.S. (08315302) which does not require calibration.

3. For instruments with Option 03, the A11 PCB Assembly is calibrated as follows:

   a. Enter 2 GHz. Adjust coil A11L1 to give a 1 MHz output from A11 and a voltage at A11TP1 of 3.1 V, approximate.

   b. Enter 2.000999 GHz. Adjust coil A11L1 to give a 1.999 MHz output from A11 and a voltage at A11TP1 of 11.5 V, approximate.

   c. Repeat steps a and b until the voltage at TP1 remains between 3.1 V and 11.5 V. Verify that instrument can be set between 2 GHz and 2.000999 GHz without error code E11 being indicated in MODULATION display. Verify that the output of A11 is locked and goes from 1 MHz at 2 GHz to 1.999 MHz at 2.000999 GHz.

4. Enter frequencies between 2 GHz and 7.9 GHz. Verify that A14TP1 remains at 0 V ±0.5 V. If necessary adjust A6R26 (figure 5-10) at 2 GHz and A6R31 at 7.9 GHz to minimize the voltage deviation from 0 V over this range. Verify E14 is not indicated in the MODULATION display proving A14 is locked.

3-6.3 Divide-by-N PCB Assembly A10 (Figure 5-16).

1. Install A10 on an extender with cover removed. Monitor its frequency if desired (9.8—39.7 MHz) at pin V. Monitor the loop voltage at A10TP1.

2. For the range of each oscillator, adjust the relevant inductor to give a stable locked output and a loop voltage within the limits below. Verify E10 is not indicated in the MODULATION display proving A10 is locked.

OSC #	FREQ OSC (GHz)	FREQ LOOP (MHz)*	VOLT	INDUCTOR
1	2.000	9.8	2.5V	L9
1	2.051	14.9	11.5V	L9
2	2.052	15.0	1.6V	L7
2	2.151	24.9	11.5V	L7
3	2.152	25.0	1.6V	L8
3	2.299	39.7	11.5V	L8

*NOTE: For 1 kHz resolution units (Option 03), output frequency is 100 kHz higher.

3-6.4 Output Phase-Locked Loop A13 (Figure 5-22).

1. Monitor A13TP1 on the DVM, and the units output on a counter.

2. Enter 0 dBm.

NOTE

YIG filter tuning. If necessary, perform paragraph 3-6.5, YIG filter peaking, at this time. If filter is too far detuned, there will be insufficient power to allow the counter to operate.

3. Enter 2 GHz. Adjust A6R37 (figure 5-10) to give a locked 2 GHz output, and 0 V ±0.5 V at A13TP1. Adjust A5R41 (figure 5-8) if necessary to tune the YIG filter low end to give sufficient power to the counter.

4. Enter 7.9 GHz. Adjust A6R47 (figure 5-10) for 0 V ±5 V at A13TP1. Adjust A5R33 (figure 5-8) to tune the YIG filter top end if necessary and verify the output is locked at 7.9 GHz.

5. Enter 8 GHz. Adjust A6R48 (figure 5-10) for 0 V ±0.5 V at A13TP1. Verify the output is locked at 8 GHz.

6. Enter 18.0 GHz. Adjust A6R57 (figure 5-10) for 0 V ±0.5 V at A13TP1. Verify the output is locked at 18.0 GHz.

NOTE

The 2 GHz tuning affects 7.9 GHz, and 8 GHz affects 18 GHz. Otherwise, set points are not interactive.

7. Verify the unit is locked from 2 GHz to 18.0 GHz, and that A13TP1 is 0 V ±1.5 V at all frequencies. If necessary, repeat steps 3 thru 6 to minimize the voltage deviation from 0 V. Verify E13 is not indicated in the MODULATION display proving A13 is locked.

8. Verify that the signal is clean at selected frequencies between 2 GHz and 18 GHz using the spectrum analyzer.

3-6.5 YIG Oscillator and YIG Tuned Filter PCB Assembly A5 (Figure 5-8).

1. Connect a power meter with a head capable of withstanding at least +20 dBm to the output.

2. Enter 2 GHz, then enter an output level of +20 dBm (or maximum allowed by software). Adjust A5R41 (YIG filter low end tuning) for maximum output (typically +15 dBm). Ensure the peak selected is the largest; there may be minor peaks at lower power levels.

3. Enter 7.9 GHz. Adjust A5R33 (YIG filter high end tuning) for maximum output, as in step 2.

4. In 10 MHz steps from 2 GHz to 7.99 GHz, verify adequate output power [+10 dBm minimum; +3 dBm for Option 12 (3 dBm) units]. If necessary, repeat steps 2 and 3 to compensate for any non-linearities. Repeat from 7.99 GHz to 2 GHz to ensure no hysteresis problems.

5. Verify the available output power is at least the specified minimum over the 2—18 GHz range. (Specification is +10 dBm, standard instruments. Option 12 instruments; e.g., Emerson, specification is +3 dBm.)

3-6.6 Downconverter Bracket Assembly A34 (Figure 5-43).

CAUTION

Adjustments are interactive and may be affected by the proximity of the trimming tool.

1. Enter 1 GHz. Monitor the output from A20J2 on an oscilloscope. Adjust the capacitors C6 and C9 on A20 for maximum output (must be at least 10 V peak-to-peak).

2. Monitor the output from A32 to A34 A2 sampler (remove the 50-ohm load from A34 sampler A2 and monitor that SMA). Adjust A8R38 (figure 5-14) for 6.0005 GHz output from A32, and 0 V ±0.5 V at TP1. Using a spectrum analyzer, verify the signal is clean, free from spurs, with good phase noise and a low noise floor.

3. Monitor the unit's output on a power meter. Enter +20 dBm. Verify at least +10 dBm is available over the 50 MHz—2 GHz band (+3 dBm for Option 12 units).

4. Monitor the unit's output on a spectrum analyzer. Verify a clean signal; if amplitude control board A3 is calibrated, verify harmonics are better than −40 dBc at 0 dBm.

3-6.7 Video Amplifier PCB Assembly A35A1 (Figure 5-46).

1. The video amp has two halves, one for use below 995 MHz, the other above 995 MHz. Each amp needs to be zeroed.

2. Disconnect all coaxes to A35A1. Enter 2 GHz. Monitor A35A1J3. Adjust R9 to set the output to 0 V ±5 mV.

3. Enter 500 MHz. Monitor J3. Adjust R24 to set the output to 0 V ±5 mV.

4. Reconnect the coaxes.

3-6.8 Amplitude Control PCB Assembly A3 (Figure 5-6).

CAUTION

Do not perform step 1 unless equipment to do level correction in step 11 is available.

1. This step sets the level correction data to zero. Level correction data is stored in the EEPROM (A2U19).

   a. Set the unit to address 25.

   b. Using a computer or busser, send the following strings to the unit:

      "FREQ 2E9 LEVEL + 0 LVCR 0 CAL"
      "FREQ 5E8 LEVEL + 0 LVCR 0 CAL"

      The unit now has level correction data of 0 dB stored in the EEPROM for locations 2 GHz, 0 dB step attenuation and 500 MHz, 0 dB step attenuation. These are the points that are used to set up A3. Note: Until the level correction program is run any other frequencies or levels may be very inaccurate.

2. DAC Calibration. Enter 2 GHz at 0 dBm. Adjust A3R121 to give 0 V ±20 mV at U4 pin 7.

3. Enter +5 dBm. Verify that A3TP3 is 1.5 V (±5 mV) (Option 12: 1.0 V ±5 mV at +3 dBm).

4. Adjust A3R82 to give 0 V ±5 mV at A3TP4 (Option 12 instruments: −300 mV at +3 dBm).

5. CW Calibration High Band. Enter 2 GHz at +5 dBm (Option 12 instruments: +3 dBm). Adjust A3R28 to give +5 dBm output power (Option 12 instruments: +3 dBm).

6. Enter −4 dBm (Option 12 instruments: −6 dBm). Adjust A3R26 to give −4 dBm output power (Option 12 instruments: −6 dBm).

7. Repeat steps 5 and 6 as required; the adjustments are interactive.

8. CW Calibration Low Band. Enter 500 MHz at +5 dBm (Option 12 instruments: +3 dBm). Adjust A3R29 to give +5 dBm output power (Option 12 instruments: +3 dBm).

9. Enter −4 dBm (Option 12 instruments: −6 dBm). Adjust A3R25 to give −4 dBm output power (Option 12 instruments: −6 dBm).

10. Repeat steps 8 and 9 as required; the adjustments are interactive.

NOTE

Perform step 11 only if step 1 has been performed.

11. Run the level correction program. Ensure that the jumper on A2 is set to the rear of the unit during the run, and to the front of the unit on completion.

3-6.9 Modulator Driver PCB Assembly A23 (Figure 5-35, Standard, or Figure 5-36, Option S6002).

1. Connect a 0—5 volt pulse, 500 nS pulse width, 1 MHz rep rate, to the PULSE connector (instrument front panel) and select [PULSE].

2. Connect a detector to the RF output. Enter 2 GHz at +3 dBm. Verify 1 MHz squarewave output from the detector on an oscilloscope. Using the second channel of the oscilloscope, monitor the pulse input.

3. Connect the input pulse to Channel A of a Model 6130 counter/timer. Connect detector output to Channel B and set counter to TIM A-B. Set Channel A to positive (+) edge trigger, and Channel B to negative (−) edge trigger.

4. Low Band. Enter 1500 MHz. Adjust A23R18 to give 300 ±20 nS start delay.

5. Reverse polarity settings on counter. Adjust A23R20 to give 300 ±20 nS stop delay.

6. Mid Band. Enter 2 GHz. Adjust A23R10 for 300 ±20 nS start delay.

7. Adjust A23R12 for 300 ±20 nS stop delay.

8. High Band. Enter 8 GHz. Adjust A23R6 for 300 ±20 nS start delay.

9. Adjust A23R8 for 300 ±20 nS stop delay.

NOTE

Paragraphs 3-6.8 and 3-6.9 must be completed prior to paragraph 3-6.10.

3-6.10 Amplitude Control PCB Assembly A3 (Pulse Mode) (Figure 5-6).

1. Replace Channel A on counter with a signal from A3, cathode of CR13. Adjust A3R111 to give 30 nS delay.

2. Reduce the input pulse width to 200 nS. Verify the sampling bridge turns off 20 nS before the RF power turns off (the sampling pulse is 150 nS).

3. Enter 2 GHz at −4 dBm (Option 12 instruments: −6 dBm). Monitor the output on a spectrum analyzer. While centering the signal, decrease the span/div to zero span. Set the triggering to video and adjust the trigger level and sweep to display the pulse train. Verify a clean pulse, with good on/off ratio (80 dB — exceeds analysis range), and minimal over or undershoot.

4. Turn the pulse off, and set the analyzer to free run trigger, 1 dB/div, fine-tune the analyzer frequency for maximum power, and set the reference level to put the line in the screen center. This is −4 dBm (Option 12 instruments: −6 dBm).

5. Turn pulse on, video trigger the analyzer, and adjust A3R32 to set the pulse top at screen center (equals to −4 dBm for standard instruments or −6 dBm for Option 12 instruments from step 4).

6. Turn pulse off, enter +5 dBm (Option 12 instruments: +3 dB), set the analyzer trigger to free run, and reset the reference level to center the trace.

7. Turn pulse on, video trigger the analyzer, and adjust A3R34 to set the pulse top at the screen center (equals +5 dBm for standard instruments or +3 dBm for Option 12 instruments). Repeat steps 3 thru 7 as required; the adjustments are interactive.

8. Low band. Repeat steps 3 thru 7 with a frequency of 500 MHz. Adjust A3R31 at −4 dBm and A3R36 at +5 dBm. Repeat as required (Option 12 instruments: −6 and +3 dBm).

3-6.11 Multiplexer/Analog-to-Digital PCB Assembly A16 (Modulation Meter) (Figure 5-31).

1. Select MODULATION [FM]. Adjust A16R18 for a display of a few kHz, and then reduce to zero. Turn A16R18 one turn further in the same direction. Select MODULATION [AM]. Adjust A16R2 for a display of a few percent, then reduce to zero. Turn A16R2 one turn further in the same direction.

NOTE

The AM input is 100 ohms, the FM input 50 ohms. Therefore, set up the input level with the relevant synthesizer input connected to the source.

2. Apply a 1.8 V peak-to-peak 10 kHz signal at the AM connector. Verify the display reads 90% (±5%). Select MODULATION [FM] and apply the signal to the FM connector. Verify the display reads 900 kHz (±50 kHz).

3-6.12 YIG Oscillator and YIG Tuned Filter Driver PCB Assembly A5 (FM Calibration) (Figure 5-8).

1. Enter 2 GHz at 0 dBm output. Monitor the output on a spectrum analyzer, set for 100 kHz/div.

2. Connect a 181.8 kHz, 2 V peak-to-peak signal to the MODULATION FM connector. Select MODULATION [FM]. FM sidebands should appear on the output.

3. Adjust A5R73 to give the second carrier null on the analyzer. (If necessary, increase the source voltage from zero while monitoring the analyzer to ensure the null is the second one.)

4. Slowly vary the test oscillator modulation frequency from 100 kHz to 1 MHz. Verify 3 dB roll off at no less than 1 MHz from center frequency at all modulation frequencies.

5. Enter 8 GHz. Repeat steps 2 thru 4, adjusting the high band calibration potentiometer A5R72.

6. Disconnect FM input.

3-6.13 Amplitude Control PCB Assembly A3 (AM Calibration) (Figure 5-6).

1. Connect the test oscillator and oscilloscope, via tee connector, to MODULATION AM connector. Adjust test oscillator to produce 10.0 kHz at 1.0 V peak-to-peak.

2. Connect spectrum analyzer to RF OUTPUT connector. Enter 3.0 GHz at +4 dBm (Option 12 instruments: −3 dBm) and tune spectrum analyzer to this frequency.

3. Set the FREQUENCY SPAN/DIV control to 100 kHz. Fine-tune the analyzer to center the carrier: ensure that the STABILIZER is on. Set the analyzer FREQUENCY SPAN/DIV to 10 kHz with a 3 kHz resolution bandwidth, then fine-tune the frequency/peaking for maximum level on the screen. Set signal to reference level using analyzer vernier level control.

4. Connect the spectrum analyzer rear panel IF OUT to the RF IN of the modulation meter.

5. Adjust A3R90 for 10 kHz sidebands at −12 dBc on spectrum analyzer display (this corresponds to 50% AM).

6. Adjust A3R93 for minimum harmonics of 10 kHz sidebands on spectrum analyzer (modulation depth is affected by this adjustment).

7. Repeat steps 5 and 6 until both conditions are met with no further adjustment. A point will be reached where the distortion begins to increase again while adjusting A3R93 in the counter-clockwise (ccw) direction; however, the percentage of modulation will change very little. This is the point where careful nulling of harmonic sidebands will be most effective.

8. Set the spectrum analyzer to zero span, ensuring the signal is centered. Unlock the bandwidth/span controls and set the resolution bandwidth to maximum. Adjust the reference level to set the signal to the top line and select "linear" vertical sensitivity. Select video triggering. Adjustment of the sweep speed and trigger level will allow the demodulated signal to be observed.

9. Set the modulation meter to read AM, 100% full scale, peak-to-peak/2, 3 kHz — 120 kHz bandwidth. If steps 5 thru 8 were performed correctly, the meter should read close to 50% modulation. If necessary, readjust A3R90. Major changes will require repeating steps 5 thru 8 since AM linearity (i.e. distortion) will be affected by this. Verify the signal on the analyzer looks relatively undistorted.

10. Set the modulation level to 0.6, 1.6 and 1.8 V peak-to-peak. The percent modulation should be 25—35%, 75—85%, and 85—95% typically.

11. Set the modulation back to 50% at 10 kHz. Set the modulation meter bandwidth to 30 Hz — 120 kHz. Slowly adjust the modulation frequency from 100 Hz to 50 kHz. The percent modulation reading should remain within 35—65% over this range, typically.

CHAPTER 4

REPLACEABLE PARTS

4-1. INTRODUCTION

4-1.1 This chapter contains the parts lists for each assembly in the 1700 Series Microwave Synthesizer. Chapter 5 contains the assembly drawings for each printed circuit board. Ordering information is included and should be used when purchasing parts from the factory. Explanation of the column listings and Table 4-1, Manufacturrers' Code-To-Name Index, are also included.

4-2. PART ORDERING INFORMATION

4-2.1 To order a part from the Replaceable Parts List, state the Systron Donner part number, indicate the quantity required and address the order to the nearest Systron Donner Sales or Service Center.

4-2.2 To order a part not listed in the Replaceable Parts List, state the instrument model number, instrument serial number, the description of parts required. Address the order to the nearest Systron Donner Sales or Service Center.

4-3. PARTS LIST

4-3.1 The replaceable parts list for each printed circuit board is presented in assembly numerical order; i.e., A1, A2, A3, etc. Each column in the parts lists provides specific information relating to the listed parts as follows:

1. ITEM: This is the find number column and lists those find numbers as called out on the respective assembly drawing.

2. SD STOCK NUMBER: The Systron Donner identifier part number is listed in this column.

3. COMPONENT DESCRIPTION: Component names and specifications are provided in this column and include value, tolerance, working voltage, wattage rating, construction, etc.

4. REF: Reference designators applicable to assemblies are listed in alpha-numeric order.

5. T/Q (Total Quantity): This quantity, appearing after an item entry, indicates the number of times the component is used in that assembly. The total quantity for each part is given only once at the first appearance of the part number in the list.

6. MFR'S CODE: Cataloging Handbook H4/H8 Commercial and Government Entity (CAGE) code numbers are listed to identify component manufacturers. A Manufacturers' Code-To-Name Index is provided in this chapter for cross-reference.

7. MANUFACTURER'S PART NUMBER: True manufacturer part numbers are listed in this column.

Table 4-1. Manufacturers' Code-To-Name Index

Mfr. Code	Manufacturer Name	Address	Zip Code
00213	Nytronics Components Group Inc.	Darlington, SC	29532
00779	Amp Inc.	Harrisburg, PA	17105
00853	Sangamo Weston Inc. Capacitor Division	Pickens, SC	29671
01121	Allen Bradley Co.	Milwaukee, WI	53203
01295	Texas Instruments Inc. Semiconductor Group	Dallas, TX	75265
02114	Amperex Electronic Corp. Ferroxcube Division	Saugerties, NY	12477
02735	RCA Corp Solid State Div.	Somerville, NJ	08876
03296	Nylon Molding Corp.	Monrovia, CA	91016
03508	General Electric Co. Semiconductor Products Div.	Auburn, NY	13021
03877	Gilbert Engineering Co., Inc. Transition Electronic Corp.	Glendale, AZ	85301
04222	AVX Ceramics Div. — AVX Corp.	Myrtle Beach, SC	29577
04713	Motorola Semiconductor Prod. Inc.	Phoenix, AZ	85008
05236	Jonathan Mfg. Corp.	Fullerton, CA	92631
05245	Corcom Inc.	Libertyville, IL	60048
05574	Viking Connectors Inc.	Chatsworth, CA	91311
05820	EG and G Wakefield Engineering	Wakefield, MA	01880
06540	Amatom Electronic Hardware Division of Mite Corp.	New Haven, CT	06515
06560	Airco Inc. Airco Electronics	Nogales, AZ	85621
06665	Precision Monolithics Inc.	Santa Clara, CA	95050
06776	Robinson Nugent Inc.	New Albany, IN	47150
07047	Ross Milton Co.	Southampton, PA	18966
07263	Fairchild Camera and Instrument Corp. Semiconductor Div.	Mountain View, CA	94039
07933	Raytheon Co. Semiconductor Div.	Mountain View, CA	94042
08289	Delbert Blinn Co. Inc.	Pomona, CA	91769
09353	C and K Components Inc.	Newton, MA	02158
11237	CTS Electronics Corp.	Paso Robles, CA	93446
11332	General Microwave Corp.	Amityville, NY	11701
11534	Duncan Electronics Inc. Subsidiary of Systron Donner	Costa Mesa, CA	92626
12463	Omtronics Mfg. Co.	Omaha, NE	68106
12598	RLC Electronics Inc.	Mt. Kisco, NY	10549
13103	Thermalloy Co.	Dallas, TX	75381
14298	ACIC Inc. Subsidiary of INSILCO Corp.	Triangle Park, NC	27709
15286	RHG Electronics Laboratory Inc.	Deer Park, NY	11729
15636	Elec-Trol Inc.	Saugus, CA	91350
15915	Tepro of Florida Inc.	Clearwater, FL	33517
16179	M/A-Com Omni Spectra Inc. Microwave Component Division	Merrimack, NH	03054
16299	Corning Glass Works	Raleigh, NC	27604
16428	Belden Corp.	Richmond, IN	47374
16733	Cablewave Systems, Inc.	New Haven, CT	06473
17856	Siliconix, Inc.	Santa Clara, CA	95054

Table 4-1. Manufacturers' Code-To-Name Index — Continued

Mfr. Code	Manufacturer Name	Address	Zip Code
18324	Signetics Corp. Military Products Division	Sacramento, CA	95834
19701	Mepco/Electra Inc.	Mineral Wells, TX	76067
20932	Illinois Tool Works Inc. Emcom Division	San Diego, CA	92121
21377	Cir-Q-Tel Inc.	Kensington, MD	20795
21847	TRW Microwave-Subsidiary of TRW	Sunnyvale, CA	94086
22599	Amerace Corp. ESNA Div.	Van Nuys, CA	91411
23880	Stanford Applied Engineering Inc.	Santa Clara, CA	95050
24355	Analog Devices Inc.	Norwood, MA	02062
24539	Avantek Inc.	Santa Clara, CA	95051
25403	Amperex Electronics Corp.	Slaterville, RI	02876
26066	Minnesota Mining and Mfg. Co. Industrial Tape Division	St. Paul, MN	55101
17014	National Semiconductors Corp.	Santa Clara, CA	95051
27264	Molex Inc.	Lisle, IL	60532
28480	Hewlett-Packard Co. Corp.	Palo Alto, CA	94304
28520	Heyman Molded Products	Kenilworth, NJ	07033
28875	IMC Magnetics Corp.	Rochester, NH	03867
29111	Trak Microwave Corp. Western Division	Sunnyvale, CA	94086
30161	AAVID Engineering Inc.	Laconia, NH	03247
31433	Union Carbide Corp. Electronics Division	Greenville, SC	29606
31918	ITT Schadow Inc.	Eden Prairie, NM	55344
32159	West-Cap Arizona	Tucson, AZ	85706
32293	Intersil Inc.	Cupertino, CA	95014
33095	Spectrum Control Inc.	Erie, PA	16505
34078	Midwest Microwave Inc.	Ann Arbor, MI	48104
50436	Hewlett-Packard	Palo Alto, CA	94304
50522	Monsanto Industries Chemicals Co.	Palo Alto, CA	94303
51642	Centre Engineering Inc.	State College, PA	16801
52542	Systron Donner Corp. Instrument Div.	Concord, CA	94518
52673	KSW Electronics Inc.	Burlington, MA	01803
52769	Sprague-Goodman Electronics Inc.	Garden City Park, NY	11040
53294	Aercom Industries Inc.	Sunnyvale, CA	94086
53919	Pasternack Enterprises	Huntington Beach, CA	92646
54487	Magnetics Inc.	Norwood, NJ	07648
54893	Hewlett-Packard Co. Microwave Semiconductor Division	San Jose, CA	95131
55210	Gettig Engineering and Mfr.	Spring Mill, PA	16875
55566	RAF Electronic Hardware Inc.	Seymour, CT	06483
56289	Sprague Electric Co.	Lexington, MA	02173
57032	Dadem Associates, Inc.	Laguna Hills, CA	92653
58202	Innowave Inc.	Morgan Hill, CA	95037
59474	Jeffers Electronics Inc.	Nogales, AZ	85621
59993	International Rectifier Semiconductor Division	El Segundo, CA	90245

Table 4-1. Manufacturers' Code-To-Name Index — Continued

Mfr. Code	Manufacturer Name	Address	Zip Code
60393	Precision Resistive Products Inc.	Mediapolis, IA	52637
71279	Midland-Ross Corp. Cambion Division	Cambridge, MA	02140
71286	Rexnard Inc. Specialty Fastener Div.	Hasbrouck Heights, NJ	07604
71400	Bussman Div. of McGraw-Edison Co.	St. Louis, MO	63178
71590	MEPCO/Centrolab	Fort Dodge, IA	50501
71707	Coto Corp.	Providence, RI	02905
72619	Dialight Div. Amperex Electronics Corp.	Brooklyn, NY	11237
72982	Murata Erie North American Inc.	Erie, PA	16512
73138	Beckman Industrial Corp. Beckman Electronics Technologies	Fullerton, CA	92635
73734	Federal Screw Products Inc.	Chicago, IL	60618
73803	Texas Instruments Inc.	Attleboro, MA	02703
75378	CTS Knights Inc.	Sandwich, IL	60548
75543	Lavelle Industries Inc.	Chicago, IL	60622
75915	Tracor Littlefuse Inc.	Des Plaines, IL	60016
76381	Minnesota Mining and Mfg. Co.	St. Paul, MN	55101
78189	Illinois Tool Works Inc. Shakeproof Division	Elgin, IL	60120
79963	Zierick Mfg. Co.	Mt. Kisco, NY	10549
80103	Veeco Instruments Inc. Lambda Electronics Division	Melville, NY	11747
80205	National Aerospace Standard		
81073	Grayhill Inc.	La Grange, IL	60525
81349	Military Specifications Promulgated by Military Departments/Agencies Under Authority of Defense Standardization Manual 4120-3M		
82647	Texas Instruments Inc. Control Products Div.	Attleboro, MA	02703
83330	Kulka Smith Inc.	Manasquan, NJ	08736
85480	W.H. Brady Co. Industrial Products Div.	Milwaukee, WI	53201
86928	Seastrom Mfg. Co. Inc.	Glendale, CA	91201
88245	Winchester Electronics Litton Systems-USECO Div.	Van Nuys, CA	91409
91418	Radio Materials Corp.	Attica, IN	47918
91506	Augat Inc. Technical Ceramics Division	Attleboro, MA	02703
91637	Dale Electronics Inc.	Columbus, NE	68601
91836	Kings Electronics Co. Inc.	Tuckahoe, NY	10707
92702	IMC Magnetics Corp.	Wesbury Long Island, NY	11591
95077	Solitron Devices Inc.	Port Salerno, FL	33492
95348	Gordos Corp.	Bloomfield, NJ	07003
96067	M/A-COM Land Mobile Communications Div of M/A COM Inc.	Sunnyvale, CA	94088
96733	SFE Technologies	San Fernando, CA	91340

Table 4-1. Manufacturers' Code-To-Name Index — Continued

Mfr. Code	Manufacturer Name	Address	Zip Code
96906	Military Specifications Promulgated by Military Departments/Agencies Under Authority of Defense Standardization Manual 4120-3M		
98278	Malco Microdot Co. Inc. Connector and Cable Division	Pasadena, CA	91030
98291	Sealectro Corp. BICC Electronics	Trumbull, CT	06611
98921	O and M Mfg Co.	Houston, TX	77029
99800	American Precision Industries Inc. Delevan Div.	East Aurora, NY	14052
99899	Narda Microwave Corp.	Hauppage, NY	11788
99942	MEPCO/Centralab	Milwaukee, WI	53209

Table 4-2. Replaceable Parts Lists

Assembly	Assembly No.	Page
Power Supply A1 Heatsink	08319601	4-7
Microprocessor A2 PC Board	08316601	4-8
Amplitude Control A3 (Standard) PC Board	08330001	4-9
Amplitude Control A3 (Option S6002) PC Board	08330002	4-12
YIG Oscillator and YIG Tuned Filter Drivers A5 PC Board	08317501	4-13
Oscillator Driver A6 PC Board	08317301	4-15
Frequency Control A7 (Standard/Option 03) PC Board	08317401/ 08317402	4-18
Fixed Local Oscillator Phase-Locked Loop A8 PC Board	08319401	4-19
Divide-by-N A10 PC Board	08318701	4-21
1 kHz Resolution Synthesizer A11 (Option 03) PC Board	08361902	4-23
100 MHz Voltage-Controlled Crystal Oscillator A12 PC Board	08319301	4-25
Output Phase-Locked Loop A13 PC Board	08319201	4-27
Reference Phase-Locked Loop A14 (Standard) PC Board	08319101	4-29
Reference Phase-Locked Loop A14 (Option 03) PC Board	08319102	4-31
Display Interface A15 PC Board	08316501	4-33
Display A15A1 PC Board	08316401	4-34
Analog-to-Digital and Multiplexer A16 PC Board	08317601	4-35
Sampler Driver A19/A20 PC Board	08337601	4-36
Pulse Modulator Driver A23 (Standard) PC Board	08330101	4-38
Pulse Modulator Driver A23 (Option S6002) PC Board	08330102	4-40
Timebase Divider A24 PC Board	08317701	4-42
2—8 GHz Output Bracket A31	08320101	4-43
8—18 GHz Output Bracket A32	08320201	4-44
2—8 GHz Reference Bracket A33	08320301	4-45
Downconverter Bracket A34 (Option 01)	08369801	4-46
Front Output Bracket A35 (Standard)	08320602	4-47
Rear Output Bracket A35 (Option 05)	08320603	4-48
Video Amplifier A35A1 PC Board	08365001	4-49

TITLE A1, Power Supply Heatsink Assembly 08319601 (Figure 5-2)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0004	708319501	SCH A1 POWER SUPPLY	REF		52542	
0005	08319701	ASSY HEATSINK CABLE HARNESS		1	52542	
0007	083211	FAB HEATSINK POWER SUPPLY 1720		1	52542	
0010	100182	CAP TANT 6.8UF 35V 10% (.2D*.	C1,4-12 C14,15 C19,20 C22 24,25,27	18	56289	150D685X9035B
0022	103275	CAP TANT 1UF 50V (20% (.15D.3	C3,13,16 18,21,26 28-30	9	56289	150D105X0050A2
0034	100580	FUSE 3AGMB 1 A 250V .25 X 1.	F4,5	2	75915	312001
0035	100587	FUSE 3AGMB 3 A 250V .25 X 1.	F2	1	75915	312003
0036	100581	FUSE 3AGMB 2 A 250V .25 X 1.	F3	1	75915	312002
0037	106228	RES MF 243 .12W 1% 100PPM	R1,3	2	16299	NA60
0038	102237	RES MF 1.27K .12W 1% 100P	R2	1	91637	MFF 1/8 T1
0039	101599	RES CC1/4W 2.7K 5%	R4	1	01121	CB2725
0041	102940	INS XSTR TO-3 MICA .16LD&MTG 1		5	08289	DM-103
0045	116638	IC VOLTREGLM317K 37-2@1.5A TO-	U1	1	27014	LM317K
0046	123182	IC VOLTREG LM350K 1.2-33V@3A T	U2	1	27014	LM350K
0047	116665	IC VOLTREGLAS1615 15V 2A (20W@	U3,10	2	80103	LAS 1615
0048	045293	IC VOLTREG320K-15 -15V I LT1A	U4	1	27014	LM320K-15
0049	117258	IC VOLTREG LM323K 5.2/4.8V 3A	U5,6,25	3	27014	LM323K
0051	103064	IC VOLTREG320K-5.2 -5.2V 5% TO	U7,8	2	27014	LM320K-5.2
0053	103295	IC VOLTREG7824 22.8/25.2V@(1A	U9,26	2	07263	7824KC
0055	116917	IC VOLTREGLAS1524 24V(1.5A(15W	U11	1	80103	LAS1524
0058	114088	SCKT TO-3 MP-3452-6 DIALLYL	XU1-11, 25,26	13		MD-3452-6
0060	102440	FUSE BLOCKFOR 3AG LUG TERMINA	XF2-5	4	75915	357001
0066	100718	CLAMP CABL 3/8D.375W.167MTG_		1	85480	FANY-375NA
0067	100851	PHMS CRES 6-32 X 9/16 PHILLIPS		26	08547	BY DESCRIPTION
0068	10063205	PHMS CRES 6-32 X.5/16		5	96906	MS51957-27
0069	10062607	PHMS CRES 4-40X7/16		11	96906	MS51957-16
0071	100662	WSHR FLAT #6 .146 ID.270 OD CR		1	86928	5710-23-10
0072	100712	WSHR LOCK SPLIT #6		31	96906	MS35338-136
0073	100703	WSHR FLAT #4 .125 ID.250 OD CR		13	96906	MS15795-803
0074	100711	WSHR LOCK SPLIT #4		11	96906	MS35338-135
0077	100509	LUG SOLDER #4INT TOOTH.69L 2HO		2	83330	1416-4
0079	100750	THERMAL COMPOUND FOR XSTR MTG.	A/R		05820	120-8

SINGLE LEVEL EXPLOSION

TITLE A2, Microprocessor PC Board Assembly 08316601 (Figure 5-4)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0002	708316601	SCH PCB CPU	REF		52542	
0003	2083166	A/W PCB CPU	REF		52542	
0005	083166	FAB PCB CPU		1	52542	
0006	117640	CAP CER DP 27PF 100V 5% C0G .1	C1,2	2	96733	DB448Y270J
0007	100176	CAP CER DP 1UF 50V 20% Z5U .38	C3,26	2	56289	2C372SU105M050B
0008	100155	CAP C MOLD .1 UF 50V 10%	C4,6	2	32159	6505BX104K
0010	103929	CAP CER DP6800PF >50V 10% 30PP	C5	1	20932	5032ED100RD682K
0012	117570	CAP CER DP .01 UF 100V 20% X7R	C7-24,28 29	20	04222	SR201C103MAA
0014	100251	CAP C MOLD1000PF 50V 20%	C25	1	71590	CW15C102M
0016	103714	CAP TANT 100UF 10V 10% RDL .2	C27	1	56289	196D107X9010PE4
0021	100385	DIODE SIG 1N4151 50V	CR1,2	2	03508	1N4151
0024	117340	CON PC PIN2*13 HEADER .25SQ .1	J3	1	30146	922584-26
0028	106673	INDUCT FXD 3.6UH 850 OHM .240	L1,2	2		VK200-20/4B
0031	101377	XSTR SI NPN 2N3904 40V 100B300	Q1	1	04713	2N3904
0034	101548	RES CC1/4W3.0K 5%	R1,2,7	3	01121	CB3025
0036	101570	RES CC1/4W 10K 5%	R3,9	2	01121	CB1035
0038	101630	RES CC1/4W 470K 5%	R4	1	01121	CB4745
0040	101569	RES CC 1/4W 1.0K 5%	R5	1	01121	CB1025
0042	119154	RES MF 118K .1W 1% 25PPM/C	R6	1	91637	CMF-55 T9
0044	101609	RES CC 1/4W 100 OHM 5%	R8	1	01121	CB1015
0046	119255	RES MODULE 9-10K 2% .25W/R 10S	RN1-3	3	01121	410103
0047	119764	RELAY REED 5V 500 OHM COIL 1FB	RL1	1	05636	RA30511051
0048	117899	SW PB SING N.O. PC MT 0.5" SQR	SW1	1	31918	210272
0050	116285	IC MICMPTR MC6802 CPU,CLK,RAM	U1	1	04713	MC6802P
0052	116322	IC TTL MSI74LS138 3-8LINE DECO	U2,8	2	27014	DM74LS138N
0054	119959	IC STATIC RAM 2KX8 24PIN ZERO	U3	1	50088	MK48Z02B-25
0056	11944001	IC STATIC RAM 2128-20 2KX8 3ST	U4	1	01295	TMS4016-45NL
0058	123071	IC MOSPROM 27128 16KX8 UV ERAS	U5-7	3	34649	27128
0060	045208	IC LIN MSCNE555V TIMER WIDE R	U9,10	2	18324	NE555V
0062	103130	IC TTL SSI74LS00 QUAD 2IN NAND	U11	1	01295	SN74LS00N
0064	116281	IC MICMPTR MC6821 PROG PIA	U12-14	3	04713	MC6821P
0066	116430	IC MICMPTR MC68488 IEEE INTFC	U15	1	04713	MC68488P
0067	116573	IC MISC MC3447 IEEE488 XCVR.3W	U16,17	2	04713	MC3447P3
0068	045299	IC TTL MSI74LS139 DUAL 2-4LINE	U18	1	01295	SN74LS139N
0069	123707	IC MOS EEPROM 2864A 8KX8 ELEC	U19	1		XLS2864AP-450
0070	102879	JUMPER, 22AWG INSULATED .09D	W1	1	55210	L-2007-1
0071	117159	SOCKET IC 40PIN .7W(.6SP)X2.02	XU1 XU12-15	5	71279	703-1340-01-04-10
0072	103845	SOCKET IC 24PIN .7W(.6S)X1.22	XU3,4	2	71279	703-1324-01-04-10
0074	116143	SOCKET IC 28PIN .7W(.6SP)X1.42	XU5-7,19	4	71279	703-1328-01-04-10
0079	116286	CRYSTAL 4 MHZ	Y1	1	75378	MP040
0080	100565	CON PC PINSINGLE MALE POST 10/		3	00779	86090-4
0081	119321	CON SHRTNG SKTS .032D@.1	W2	1	0	MJB3404-08CUSN
0085	101060	SPCR SWAGE2-56 .13L.16D.128MT.		4	71279	350-2188-09
0087	10070004	FHMS CRES 2-56X1/4		4	90205	NAS662C2R4
0093	083189	FAB PCB SHIELD (LARGE)		1	52542	

SINGLE LEVEL EXPLOSION

TITLE A3, Amplitude Control PC Board Assembly 08330001 (Standard) (Figure 5-6)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0003	708330001	SCHEM AMPL CNTRL	REF		52542	
0004	2083300	ARTWORK AMPL CNTRL	REF		52542	
0006	083300	FAB PCB AMPL CNTRL		1	52542	
0007	117639	CAP CER DP 1000PF 100V 5% C0G	C1,2,29 C31	4	96733	DB45BY102J
0009	11981901	CAP CER MLD 1.5NF 200V 10% C0G	C3	1	96733	RH06BY152K
0013	117626	CAP CER DP68PF 100V 5% C0G .1L	C7,24,25	3	96733	DB44BY680J
0014	100176	CAP CER DP 1UF 50V 20% Z5U .3B	C8,15, 17-21,55	9	56289	2C37Z5U105M050B
0015	100374	CAP C MOLD.01 UF 50V 10%	C9	1	32159	6S04BX103K
0018	100178	CAP CER DP .1UF 50V 20% Z5U .3	C12	1	56289	2C37Z5U104M050B
0020	117570	CAP CER DP .01 UF 100V 20% X7R	C22 C23 C37-45 C47-53 C57-59	21	04222	SR201C103MAA
			C16		52542	
0032	100155	CAP C MOLD .1 UF 50V 10%	C26,60, 61,62	4	32159	6S05BX104K
0033	100203	CAP TANT 2.2UF 20V 10%	C27	1	56289	150D225X9020A2
0034	100205	CAP TANT 4.7UF 10V 10%	C28	1	56289	150D475X9010A2
0036	100071	CAP TANT 4.7UF 35V 10%	C30	1	56289	150D475X9035B2
0038	10010301	CAP C DISC.01UF 100V 80/-20% I	C33,34	2	72982	DD560B10ZU103Z100V
0063	117628	CAP CER DP100PF 100V 5% C0G .1	C63	1	96733	DB44BY101J
0065	102703	DIODE SIG FDH300 <1NA@125V 1V@	CR1-4	4	13715	FDH300
0069	100385	DIODE SIG 1N4151 50V	CR5-11 15,16,19 20,22-28 30,31	23	03508	1N4151
0077	100435	DIODE SGNLFD700 20V FAST RECO	CR13,14	2	13715	FD700
0080	100442	DIODE SIGL HP-2800 70V 100PS U	CR29	1	28480	5082-2800
0089	11981801	RELAY 12V R850 DPDT 1A@28V TO-	K1-5	5		732-12
0090	117279	NYLON WSHRFLAT .255ID.375OD.03	K1-5	5	86928	5610-120-31
0094	101377	XSTR SI NPN 2N3904 40V 100B300	Q1,2,5	3	04713	2N3904
0096	101378	XSTR SI PNP 2N3906 40V 100B300	Q3,4,10 Q11	4	04713	2N3906
0099	117349	XSTR SIPNPMPS-A63 30V H>5K@10M	Q6	1	04713	MPS-A63
0100	101396	XSTR SI NPN MPS-A12 DARLINGTON	Q7,12,13 14	4	04713	MPS-A12
0101	103347	JFET PCHAN 2N3993 25V RDS<150	Q8,9	2	04713	2N3993
0104	102199	RES MF 6.19K .12W 1% 100P	R1	1	91637	MFF 1/8 T1
0105	101716	RES CC 1/8W 6.8K 5%	R2,10	2	01121	BB6825
0106	101799	RES CC1/8W8.2K 5%	R3,6,8 R11	4	01121	BB8225
0107	102085	RES MF 909 .12W 1% 100P	R4,9	2	91637	MFF 1/8 T1
0108	101714	RES CC1/8W3.9K 5%	R5,7	2	01121	BB3925
0115	101907	RES MF 1.00M .12W 1% 100PPM/C	R12,81, R92	3	19701	MF5C-0-1004-F
0116	102086	RES MF 1000HMS .12W 1% 100PPM	R13	1	91637	CMF-60 T1
0117	102098	RES MF 10.0K .12W 1% 100P	R14,	9	19701	MF5C-0-1002-F

TITLE A3, Amplitude Control PC Board Assembly 08330001 (Standard) (Figure 5-6) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
			R85-89 101,123			
0118	102097	RES MF 1.00K .12W 1% 100P	R15,17, R19,21, R23	5	19701	MF5C-0-1001 F
0119	101975	RES CC1/8W 12K 5%	R16,43 R45,46 R59,60	6	01121	BB1235
0121	102083	RES MF 200K .12W 1% 100P	R18,20 R103,104	4	19701	MF5C-0-2003-F
0125	123001	RES MF 200K .1W 1% 25PPM1C.14D	R22,24, R40	3	91637	CMF-55-T9
0128	118842	POT 20T PC50K .5W 10% ENDADJ <	R25,26 R31,32 R90,102	6	73138	66XR50K
0130	116980	RES MF 5.11K .1W 1% 50PPM/C	R27,29 R33,35 R61, R109,110	7	16299	NC55 5.11K 1%
0131	118839	POT 20T PC5K .5W 10% ENDADJ <.	R28,30, 34,36,98	5	73138	66XR5K
0140	117585	RES MF 10.0K .1 W 1% 100PPM	R37,39	2		C=RN55D1002F
0141	123000	RES MF 150K 1% .1W 25PPM/C.14D	R38,117	2	91637	CMF-55 T9
0143	123002	RES MF 301K .1W 1% 25PPM/C.14D	R41,42, R119	3	91637	CMF-55 T9
0147	101822	RES CC1/8W 68K 5%	R44,48 R49,68 R73,74 R75	7	01121	BB6835
0150	101803	RES CC1/8W 2.7K 5%	R57,72	2	01121	BB2725
0153	101711	RES CC1/8W1.0K 5%	R50,51	2	01121	BB1025
0155	101707	RES CC1/8W 47 OHMS 5%	R52,53 R105	3	01121	BB4705
0157	101804	RES CC1/8W 510 OHMS 5%	R54,55	2	01121	BB5115
0159	101826	RES CC1/8W150K 5%	R56	1	01121	BB1545
0161	101760	RES CC 24K 1/8W 5%	R58	1	01121	BB2435
0165	101599	RES CC1/4W 2.7K 5%	R118	1	01121	CB2725
0166	101565	RES CC 1/4W 12K 5%	R64-67 R69	5	01121	CB1235
0174	101597	RES CC1/4W 68K 5%	R71	1	01121	CB6835
0179	101976	RES CC1/8W100K 5%	R76,78	2	01121	BB1045
0182	101702	RES CC1/8W150 OHMS 5%	R79	1	01121	BB1515
0183	102222	RES MF 80.6K .12W 1% 100P	R80,84, R126	3	19701	MF5C-0-8062-F
0185	118841	POT 20T PC20K .5W 10% ENDADJ	R82,93	2	73138	66XR20K
0187	106201	RES MF 787K .12W 1% 50PPM	R83	1		RN60C7873F
0194	102082	RES MF 49.9K .12W 1% 100P	R91	1	91637	MFF 1/8 T1
0197	102286	RES MF 61.9K .1 W 1% 50P	R94	1		RN55C6192F
0198	102080	RES MF 100K .12W 1% 100P	R95-97	3	91637	MFF 1/8 T1
0201	102525	RES MF 100K .1 W 1% 50P	R100	1		RN55C1003F

TITLE A3, Amplitude Control PC Board Assembly 08330001 (Standard) (Figure 5-6) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0202	102157	RES MF 9.09K .12W 1% 100P	R99	1	19701	MF5C-0-9091-F
0209	102090	RES MF 49.9 .1 W 1% 25P	R120	1	19701	MF4C-E-49R9 F
0214	102099	POT 5K 20% 1/2W CERM T	R111	1	'('	TM-7W-5K OHM
0215	119072	RES MF 20.0K .1W 1% 25PPM/C	R112,124 R125	3	91637	CMF-55 T9
0216	119008	RES, 4.99K, 1%, MF	R113,122	2	91637	CMF-55 T9
0217	101564	RES CC1/4W 10M 5%	R114	1	01121	CB1065
0218	102525	RES MF 100K .1 W 1% 50P	R115	1		RN55C1003F
0219	118985	RES MF 3.01K .1W 1% 25PPM/C	R116	1	91637	CMF-55 T9
0221	103845	SOCKET IC 24PIN .7W(.6S)X1.2Z	XU10	1	71279	703-1324-01-04-10
0224	117558	IC LIN MSC1413P 7 50V 500MA NP	U1,2	2	04713	MC1413P
0226	119966	DAC IC 12BIT 4QUAD MULT CMOS	U3	1	24335	AD7541AJN
0227	123543	IC OP AMP AD642KH DUAL FET INP	U4	1	24335	AD642KH
0230	103492	IC CMOS SS4050 6 ^INVT BFR >2M	U6	1	04713	MC140508P
0232	117671	DAC ASSY 3DIG BCD 9.99V .1% 1	U10	1		DAC85C-CCD-V
0233	117116	IC CMOS 4099 8BIT ADRSL LATC	U11-14	4	02735	CD4099BE
0235	045283	IC CMOS 4001 QUAD-2IN NOR GA	U15	1	04713	MC14001BCP
0241	117703	IC OP AMP TL072 2JFET A68DB 10	U19,20 U24,27 U32,33	6	01295	TL072CP
0243	118006	LOGAMP HYB759P 2%-10NA/-1MA .0	U21,30	2	24335	759P
0244	117250	IC CMOS MSI IH5043 2 SPDT R=80	U22,23 U25	3	32293	IH5043CPE
0248	117838	IC OP AMP AD542LH JFET A104DB	U26	1	24355	AD542LH
0250	117093	IC OP AMP LF356A 94DB IB<50PA	U28	1	27014	LF356AH
0251	045209	IC TTL SSI74123 DUAL ONE-SHOT	U29	1	01295	SN74123N
0253	116590	IC OP AMP TL074 4JFET A68DB 10	U31	1	01295	TL074CN
0256	102879	JUMPER, 22AWG INSULATED .09D	W2-7	6	55210	L-2007-1
0258	100565	CON PC PINSINGLE MALE POST 10/	TP1-4	4	00779	86090-4
0260	101060	SPCR SWAGE2-56 .13L.16D.128MT.		4	71279	350-2188-09
0261	083189	FAB PCB SHIELD (LARGE)		1	52542	
0262	10070004	FHMS CRES 2-56X1/4		4	80205	NAS662C2R4

SINGLE LEVEL EXPLOSION

TITLE A3, Amplitude Control PC Board Assembly 08330002 (Option S6002) (Figure 5-6) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0001	08330001	ASSY PCB AMPLITUDE CONTROL		1	52542	
0002	102703	DIODE SIG FDH300 <1NA@125V 1V@	CR32,33	2	13715	FDH300
0003	101711	RES CC1/8W1.0K 5%	R127	1	01121	BB1025

SINGLE LEVEL EXPLOSION

TITLE A5, YIG Oscillator and YIG Tuned Filter Drivers PC Board Assembly 08317501 (Figure 5-8)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0002	708317501	SCH PCB YIG DRIVER	REF		52542	
0003	2083175	A/W PCB YIG OSC DRIVER	REF		52542	
0005	083175	FAB PCB YIG OSC DRIVER		1	52542	
0008	106514	CAP TANT 47UF 20V 20%	C1,58	2	56289	196D476X0020PE4
0010	100155	CAP C MOLD .1 UF 50V 10%	C2,3,5,7 10,22,24 26-35, 37-42,50	24	32159	6505BX104K
0012	106513	CAP TANT 4.7UF 20V 20% RAD LE	C4,9,52 53	4	56289	196D475X0035JA1
0016	100251	CAP C MOLD1000PF 50V 20%	C6,11	2	71590	CM15C102M
0018	117625	CAP CER DP56PF 100V 5% COG .1L	C8	1	96733	DB44BY560J
0022	100333	CAP C DISC.033UF 25V 20%	C12	1	71590	UK25-333
0023	11228101	CAP TANT 22UF 25V 20% RDLD@.2	C13,55, 56	3		TAPB22M25
0024	100176	CAP CER DP 1UF 50V 20% Z5U .38	C21	1	56289	2C3Z5U105M050B
0025	310382	CAP C DIP .33UF 100V 20%	C14,16, 18,20	4	31433	C330C334M1U1CA
0028	117570	CAP CER DP .01 UF 100V 20% X7R	C15,17, 19,43-49 57-59	13	04222	SR201C103MAA
0030	102605	CAP TANT 8.2UF 15V 10% RADIAL	C23,25	2	31433	T330A825K015AS
0034	100443	DIODE SGNL1N4829 20V 1.87V FW	CR1,2,5, 6,21	5	03508	1N4829
0036	100442	DIODE SIGL HP-2800 70V 100PS U	CR3,4,7, 8	4	28480	5082-2800
0038	102703	DIODE SIG FDH300 <1NA@125V 1V@	CR9,10,	2	13715	FDH300
0040	100413	DIODE RECT1N5395 400V 1.5A.26L	CR11,13, 17,19	4	04713	1N5395
0043	100385	DIODE SIG 1N4151 50V	CR12,14, 15,16,18 20,26-31	12	03508	1N4151
0045	106549	DIODE ZENR1N5342B 6.8V 5% 5W75	CR22-25	4	04713	1N5342B
0050	106587	XSTR SINPN2N2219A W/HEAVY KOVA	Q1,3	2	07263	2N2219A SF HDR
0052	705067	XSTR SIPNP 2N2905A 60V 100B300	Q2,4	2		2N2905AS
0054	101358	XSTR SI NPN PN3643 30V 100B300	Q5,7	2	07263	PN3643-5
0056	101367	XSTR SI PNP PN3645 60V 80B240	Q6,8	2	07263	PN3645-18
0057	101417	JFET NCHNL2N4393 40V R<100 -3V	Q21	1	01295	2N4393
0058	12314001	MOSFET NCH IRF511 60V <.6OHM T	Q9-20	12	81483	IRF 511
0067	101542	RES CC1/4W270 OHMS 5%	R1	1	01121	CB2715
0069	103402	RES MF 9.0 K .13W .1% 25PPM	R2	1	91637	CMF60 T9
0071	117757	RES MF 1.00K .1 W 1% 100PPM	R3,48, 52,54,60 75	6		C=RN55D1001F
0074	102525	RES MF 100K .1 W 1% 50P	R4,29,34 46,47,50 51,53,58 59,74,76	12		RN55C1003F
0079	101697	RES CC1/8W 10K 5%	R5,6,16, 17	4	01121	BB1035

TITLE A5, YIG Oscillator and YIG Tuned Filter Drivers PC Board Assembly 08317501 (Figure 5-8) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0082	101706	RES CC1/8W 22 OHMS 5%	R7,8,64 65	4	0112	BB2205
0085	119025	RES MF 7.32K .1W 1% 25PPM/C	R9,12,18 21	4	91637	CMF-55 T9
0088	101702	RES CC1/8W150 OHMS 5%	R10,11, 19,20	4	01121	BB1515
0091	101784	RES CC1/4W2.7 OHMS 5%	R13,14, 22,23	4	01121	CB2765
0094	101527	RES CC1/2W150 OHMS 5%	R15	1	01121	EB1515
0095	101508	RES CC1/2W120 OHMS 5%	R24	1	0112	EB1215
0096	101735	RES CC1/4W 56 OHMS 5%	R25	1	0112	CB5605
0098	116993	RES MF 10.0K .1W 1% 5PPM/C	R26,27	2	60393	PR1/10 TC5
0099	119057	RES MF 14.7K .1W 1% 25PPM/C	R28	1	91637	CMF-55 T9
0100	116995	RES MF 15.8K .1W 1% 5PPM/C	R30	1	60393	PR1/10 TC5
0102	119171	RES MF 499K .1W 1% <25PPM/C	R31	1	91637	CMF-55 T9
0106	118838	POT 20T PC2K .5W 10% ENDADJ <.	R33,41	2	73138	66XR2K
0107	11950201	RES MF 1.27K .1W 1% 50PPM/C <.	R32	1	91637	CMF 55 T2
0108	117583	RES MF 1.50K .1 W 1% 100PPM	R35	1		C=RN55D1501F
0110	102086	RES MF 100OHMS .12W 1% 100PPM	R36,44, 45,55,56 61,62	7	91637	CMF-60 T1
0114	118822	RES WWPREC2.0 1% 5W5PPM NINDC	R37	1	12463	N5 9 2F C5
0118	118997	RES MF 3.92K .1W 1% 2	R39	1	91637	CMF-55 T9
0120	102226	RES MF 8.06K .12W 1% 100P	R40	1	19701	MF5C-D-8061-F
0124	119036	RES, 9.09K, 1% MF	R42	1	91637	CMF-55 T9
0133	106250	RES MF 499 .12W 1% 100PPM	R66,68, 70	3	16299	NA60
0136	106224	RES MF 2.00K .12W 1% 100PPM	R67	1	16299	NA60
0138	117590	RES MF 2.67K .1 W 1% 100PPM	R69,71	2		C=RN55D2671F
0140	118837	POT 20T PC1K .5W 10% ENDADJ <.	R72,73	2	73138	66XR1K
0166	117250	IC CMOS MSI IH5043 2 SPDT R=80	U1	1	32293	IH5043CPE
0168	123543	IC OP AMP AD642KH DUAL FET INP	U2	1	24335	AD642KH
0169	123544	IC OP AMP OP-27EN PRECISION UC	U3	1	24335	OP-27EN
0170	118870	IC VOLTREGLM317T 37-2V@1.5A TO	U4,6	2	27014	LM317T
0172	103198	IC OP AMP LM324 QUAD A1E5 IBLT	U5	1	27014	LM324N
0174	119989	IC VOLTREG LM337T -1.2 TO -37V	U7	1	27041	LM337T
0175	118820	I.C. AD580	U8	1	24335	AD580J
0177	102879	JUMPER, 22AWG INSULATED .09D	W1	1	55210	L-2007-1
0180	118873	HEATSINK, TO220, #5771B	XQ9-20, XU4,6,7	15	30161	5771B
0184	10062605	PHMS CRES 4-40 x 5/16	XQ9-21	15	96906	MS51957-14
0186	100622	NUT HEX 4-40 .19AF .06THK SS		15	80205	NAS671C4
0187	100711	WSHR LOCK SPLIT #4		15	96906	MS35338-135
0191	083189	FAB PCB SHIELD (LARGE)		1	52542	
0192	101060	SPCR SWAGE2-56 .13L.16D.12BMT.		4	71279	350-2188-09
0193	10070003	SCREW 2-56X3/16,PHMS		4	80205	NAS662C2R3
0194	100750	THERMAL COMPOUND FOR XSTR MTG.	A/R		05820	120-8

SINGLE LEVEL EXPLOSION

TITLE A6, Oscillator Driver PC Board Assembly 08317301 (Figure 5-10)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0002	708317301	SCHEM PCB OSCILLATOR DRIVER	REF		52542	
0003	2083173	A/W PCB OSCILLATOR DRIVER	REF		52542	
0005	083173	FAB PCB OSCILLATOR DRIVER		1	52542	
0010	11228101	CAP TANT 22UF 25V 20% RDLD@.2	C1,11-13 63,64,66 68	8		TAPB22M25
0013	100374	CAP C MOLD.01 UF 50V 10%	C2,16,18 20-23, 28-31 34-39 42-57 69-71	36	32159	6S04BX103K
0016	117628	CAP CER DP100PF 100V 5% COG .1	C3,4	2	96733	DB44BY101J
0019	117675	CAP CER DP390PF 100V 5% COG .1	C5,6	2	96733	DB45BY391J
0022	117633	CAP CER DP220PF 100V 5% COG .1	C7	1	96733	DB44BY221J
0025	11979801	CAP CER DP .033UF 50V 10% X7R	C8-10	3	71590	CW20C333K
0031	100155	CAP C MOLD .1 UF 50V 10%	C14,15, 17,19, 58-62	9	32159	6S05BX104K
0034	102609	CAP TANT 4.7UF 25V 10% RADIAL	C65	1	31433	K4R7W25K
0040	100385	DIODE SIG 1N4151 50V	CR1-8	8	03508	1N4151
0043	100443	DIODE SGNL1N4829 20V 1.87V FW	CR10	1	03508	1N4829
0046	102703	DIODE SIG FDH300 <1NA@125V 1V@	CR11-13	3	13715	FDH300
0051	100404	DIODE ZENR 18V 5% .4W 1N967B	CR14	1	04713	1N967B
0056	106616	XSTR SIPNPMPSA14 30V B>10K@10M	Q1,3,5,7 9,11,13, 15	8	04713	MPSA14
0059	101367	XSTR SI PNP PN3645 60V 80@240	Q2,4,6,8 10,12,14 16	8	07263	PN3645-18
0063	101417	JFET NCHNL2N4393 40V R<100 -3V	Q17-19	3	01295	2N4393
0065	101378	XSTR SI PNP 2N3906 40V 100@300	Q20,22, 24	3	04713	2N3906
0068	101377	XSTR SI NPN 2N3904 40V 100@300	Q21,23, 25	3	04713	2N3904
0072	102090	RES MF 49.9 .1 W 1% 25P	R1-2	2	19701	MF4C-E-49R9 F
0075	117536	POT 18T PC 200 OHMS .5W,10%	R3,4	2	73138	68XR200
0077	119041	RES MF 10.0K .1W 1% 25PPM/C	R5,6, 11-13,15 38,52, 101	9	91637	CMF-55 T9
0078	119031	RES MF 10.7K .1W 1% 25PPM/C	R7,8	2	91637	CMF-55 T9
0079	119042	RES MF 10.2K .1W 1% 25PPM/C	R22	1	91637	CMF-55 T9
0080	102172	RES MF 13.7K .12W 1% 100P	R9,10	2	19701	MF5C-D-1372-F
0083	119146	RES MF 100K 1% .1W 25PPM	R14,20 39,53,66 99,100	7	91637	CMF-55 T9
0085	118997	RES MF 3.92K .1W 1% 2	R16,18 19	3	91637	CMF-55 T9
0086	119022	RES MF 6.81K .1W 1% 25PPM/C	R17	1	91637	CMF-55 T9

TITLE A6, Oscillator Driver PC Board Assembly 08317301 (Figure 5-10) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0088	119104	RES MF 40.2K .1W 1% 25PPM/C	R21	1	91637	CMF-55 T9
0090	119070	RES MF 19.6K .1W 1% 2	R23,34 44	3	91637	CMF-55 T9
0092	118976	RES MF. 2.55K .1W 1% 25PPM/C	R24,29	2	91637	CMF-55 T9
0093	118963	RES, 1.82K, 1%, MF	R25,30 45,50	4	91637	CMF-55 T9
0094	118838	POT 20T PC2K .5W 10% ENDADJ <.	R26,31, 37,47,48	5	73138	66XR2K
0097	119031	RES MF 10.7K .1W 1% 25PPM/C	R27	1	91637	CMF-55 T9
0100	119071	RES MF 20.5K .1W 1% 25PPM/C	R28	1	91637	CMF-55 T9
0103	119047	RES MF 11.8K .1W 1% 2	R32	1	91637	CMF-55 T9
0106	118821	RES WWPREC 10.00 1% 5W 5PPM NI	R33,42	2	12463	N5 9 10F C5
0109	118969	RES MF 2.15K .1W 1% 25PPM/C	R35	1	91637	CMF-55 T9
0111	118961	RES MF 1.78K .1W 1% 25PPM/C	R36	1	91637	CMF-55 T9
0114	119098	RES MF 34.8K .1W 1% 25PPM/C	R40	1	91637	CMF-55 T9
0117	119046	RES MF 11.5K .1W 1% 2	R41	1	91637	CMF-55 T9
0120	123285	RES MF 562K .1W 1% 25PPM	R43	1	91637	CMF-55 T9
0126	118955	RES MF 1.58K .1W 1% 2	R49	1	91637	CMF-55 T9
0126	118977	RES MF 2.61K .1W 1% 25PPM/C	R46	1	91637	CMF-55 T9
0129	119072	RES MF 20.0K .1W 1% 25PPM/C	R51	1	91637	CMF-55 T9
0132	119111	RES MF 47.5K .1W 1% 25PPM/C	R54	1	91637	CMF-55 T9
0134	119005	RES MF 4.64K .1W 1% 25PPM/C	R55	1	91637	CMF-55 T9
0136	118985	RES MF 3.01K .1W 1% 25PPM/C	R56	1	91637	CMF-55 T9
0138	118839	POT 20T PC5K .5W 10% ENDADJ <.	R57	1	73138	66XR5K
0140	123002	RES MF 301K .1W 1% 25PPM/C.14D	R58	1	91637	CMF-55 T9
0142	119015	RES MF 5.90K .1W 1% 25PPM/C	R59	1	91637	CMF-55 T9
0144	118822	RES WWPREC2.0 1% 5W5PPM NINDC	R60	1	12463	N5 9 2F C5
0146	119171	RES MF 499K .1W 1% <25PPM/C	R61-63	3	91637	CMF-55 T9
0148	119176	RES MF 475 .1W 1% 25PPM/C	R64	1	91637	CMF-55 T9
0150	123139	RES MF 100 .1W 1% 25PPM/C <.14	R65,67 69,71,72 74	6	91637	CMF-55 T9
0155	118953	RES MF 1.50K .1W 1% 25PPM/C	68,70,73	3	91637	CMF-55 T9
0157	101599	RES CC1/4W 2.7K 5%	R76,79, 82,85,88 91,94,97	8	01121	CB2725
0158	101577	RES CC1/4W 1.5K 5%	R77,78, 81,86,89 92,95,98	8	01121	CB1525
0159	101943	RES MF 150K .1W 1% 100PPM/C	R75,80, 83,84,87 90,93,96	8	19701	MF5C-D-1503-F
0163	119088	RES MF 28.0K .1W 1% 2	R104	1	91637	CMF-55 T9
0170	116440	IC MOSPROM2716 2K*8 UV ERS <45	U1-3	3	34649	B2716
0173	119966	DAC IC 12BIT 4QUAD MULT CMOS	U4,5	2	24335	AD7541AJN
0175	123543	IC OP AMP AD642KH DUAL FET INP	U6-9,19, 20	6	24335	AD642KH
0176	117838	IC OP AMP AD542LH JFET A104DB	U10	1	24355	AD542LH
0177	123544	IC OP AMP OP-27EN PRECISION UC	U15-17	3	24335	OP-27EN
0179	117703	IC OP AMP TL072 2JFET A68DB 10	U18	1	01295	TL072CP

TITLE A6, Oscillator Driver PC Board Assembly 08317301 (Figure 5-10) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0182	117508	IC TTL MS174LS244 8BFR 2ENBL L	U21	1	01295	SN74LS244N
0183	118868	IC VOLTREF AD581LH TO5	U22	1	24355	AD581LH
0185	102879	JUMPER, 22AWG INSULATED .09D	W1-12	12	55210	L-2007-1
0188	103845	SOCKET IC 24PIN .7W(.6S)X1.22	XU1-3	3	71279	703-1324-01-04-10
0190	117878	SOCKET IC 18PIN .4W(.3SP)X .98	XU4,5	2	71279	703-1318-01-04-10
0192	101060	SPCR SWAGE2-56 .13L.16D.128MT.		4	71279	350-2188-09
0195	100565	CON PC PINSINGLE MALE POST 10/		6	00779	86090-4
0196	10070004	FHMS CRES 2-56X1/4		4	80205	NAS662C2R4
0202	083189	FAB PCB SHIELD (LARGE)		1	52542	

SINGLE LEVEL EXPLOSION

TITLE A7, Frequency Control PC Board Assembly 08317401/08317402 (Standard/Option 03) (Figure 5-12)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0002	708317401	SCH PCB FREQ COUNTROL	REF		52542	
0003	2083174	A/W PCB FREQ CONTROL	REF		52542	
0005	083174	FAB PCB FREQ CONTROL		1	52542	
0010	100178	CAP CER DP .1UF 50V 20% Z5U .3	C1	1	56289	2C37Z5U104M050B
0013	117570	CAP CER DP .01 UF 100V 20% X7R	C2-6, 9-33,35 39	32	04222	SR201C103MAA
0016	100176	CAP CER DP 1UF 50V 20% Z5U .38	C7,8	2	56289	2C37Z5U105M050B
0019	117621	CAP CER DP 10PF 100V 5% C0G	C34	1	96733	DB44BY100J
0022	11228101	CAP TANT 22UF 25V 20% RDLD@.2	C36,37	2		TAPB22M25
0025	102609	CAP TANT 4.7UF 25V 10% RADIAL	C38	1	31433	K4R7W25K
0032	101378	XSTR SI PNP 2N3906 40V 100B300	Q1-3	3	04713	2N3906
0038	117585	RES MF 10.0K .1 W 1% 100PPM	R1,2,4,6 8,	5		C=RN55D1002F
0042	102480	RES MF 3.92K .1 W 1% 100P	R3,5,7	3	91637	CMF-55 3921 T1
0047	106229	RES MF 2.43K .12W 1% 100PPM	R9	1	16299	MA60
0050	118835	POT 20T PC100 .5W 10% ENDADJ (	R10	1	73138	66XR100
0053	118837	POT 20T PC1K .5W 10% ENDADJ (.	R11	1	73138	66XR1K
0056	119004	RRES MF 4.53K .1W 1% 2	R12	1	91637	CMF-55 T9
0059	117818	RES MF 4990HMS.1 W 1% 100 PPM	R13,14	2		C=RN55D4990F
0062	117576	RES MF 4.99K .1 W 1% 100PPM	R15	1		C=RN55D4991F
0065	119981	RES MODULE 8@10K 2% .25W/R@70C	RN1	1	80294	4116R-001-103
0068	116187	IC CMOS 4042 QUAD LATCH +/-E	U1-13	13	04713	MC14042BCP
0071	117850	IC TTLPROMUPB426-E 1024*4 3STA	U14	1	50364	6353-1J
0074	123040	IC CMOS MSI4514 4BIT LATCH/4-1	U15	1	04713	MC14514BCP
0077	11988701	IC CMOS SN74HC244 OCT BFR/LINE	U16	1	01295	SN74HC244N
0080	117703	IC OP AMP TL072 2JFET A68DB 10	U17,22	2	01295	TL072CP
0083	103433	IC CMOS MC14560 NBCD ADDER	U18,20, 21	3	04713	MC14560BCP
0086	117528	DAC ASSY 2DI6 BCD MULTIPLYING	U19	1		DAC-20CQ
0091	118868	IC VOLTREF AD581LH TO5	U23	1	24335	AD581LH
0094	11965601	DAC IC 12BIT W/LATCHES CURRENT	U24	1	24335	AD567JD
0096	103217	IC CMOS 4049 HEX INV BUFF LT	U25	1	02735	MC14049BCP
0100	100565	CON PC PINSINGLE MALE POST 10/	TP1	4	00779	86090-4
0101	103845	SOCKET IC 24PIN .7W(.6S)X1.22	XU15	1	71279	703-1324-01-04-10
0102	116143	SOCKET IC 28PIN .7W(.6SP)X1.42	XU24	1	71279	703-1328-01-04-10
0103	117878	SOCKET IC 18PIN .4W(.3SP)X .98	XU14	1	71279	703-1318-01-04-10
0105	083190	FAB PCB SHIELD (SMALL)		1	52542	
0108	101060	SPCR SWAGE2-56 .13L.16D.128MT.		4	71279	350-2188-09
0110	10070004	FHMS CRES 2-56X1/4		4	80205	NAS662C2R4
0112	119321	CON SHRTNG SKTS .032D@.1	W1	1	0	MJB3404-08CUSN

SINGLE LEVEL EXPLOSION

TITLE A8, Fixed Local Oscillator Phase-Locked Loop PC Board Assembly 08319401 (Figure 5-14)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0001	708319401	SCH PCB FIXED LO PLL	REF		52542	
0002	2083194	A/W PCB FIXED LO PLL	REF		52542	
0004	083194	FAB PCB FIXED LO PLL		1	52542	
0014	100155	CAP C MOLD .1 UF 50V 10%	C9-11,21 23,24,26 28-30 39,40 42-44,47 48	17	32159	6S05BX104K
0017	100176	CAP CER DP 1UF 50V 20% Z5U .38	C12,37, 45,46	4	56289	2C37Z5U105M050B
0018	117629	CAP CER DP120PF 100V 5% COG .1	C13,C14	2	96733	DB44BY121J
0020	100374	CAP C MOLD.01 UF 50V 10%	C15,17, 35,52	4	32159	6S04BX103K
0021	11228101	CAP TANT 22UF 25V 20% RDLD@.2	C25, 27,31	3		TAP822M25
0031	100333	CAP C DISC.033UF 25V 20%	C36	1	71590	UK25-333
0034	103716	CAP TANT 1UF 35V 10%	C49	1	56289	196D105X9035HA1
0045	100385	DIODE SIG 1N4151 50V	CR7,8	2	03508	1N4151
0046	102703	DIODE SIG FDH300 <1NA@125V 1V@	CR1-3	3	13715	FDH300
0047	100427	DIODE RECT1N4006 800V 1A	CR6	1	04713	1N4006
0059	12314001	MOSFET NCH IRF511 60V <.60HM T	Q3	1	81483	IRF 511
0067	101609	RES CC 1/4W 100 OHM 5%	R2,3	2	01121	CB1015
0070	101616	RES CC1/4W 510 OHM 5%	R4-9	6	01121	CB5115
0077	101577	RES CC1/4W 1.5K 5%	R11	1	01121	CB1525
0078	101625	RES CC1/4W470 OHMS 5%	R10,R12	2	01121	CB4715
0079	101583	RES CC1/4W 560 OHMS 5%	R13,14	2	01121	CB5615
0081	101729	RES CC1/4W 27 OHMS 5%	R15 R16	1	0112	CB2705
0083	116993	RES MF 10.0K .1W 1% 5PPM/C	R40,53, 55	3	60393	PR1/10 TC5
0084	117576	RES MF 4.99K .1 W 1% 100PPM	R17,18, 61,62	4		C=RN55D4991F
0085	101558	RES CC1/4W 100K 5%	R27,28, 33,42	4	01121	CB1045
0086	118989	RES MF 3.32K .1W 1% 25PPM/C	R20,21, 19,54	4	91637	CMF-55 T9
0092	101597	RES CC1/4W 68K 5%	R25,26	2	01121	CB6835
0095	101570	RES CC1/4W 10K 5%	R29,30, R45	3	01121	CB1035
0096	101569	RES CC 1/4W 1.0K 5%	R31,43, 32	3	01121	CB1025
0100	101574	RES CC1/4W 47K 5%	R34	1	01121	CB4735
0102	118834	RES MF 1.21K .1W 1% 5PPM <.14D	R36	1	60393	PR1/10 1.21KTC5
0103	119048	RES, 12.1K 1% MF	R37	1	91637	CMF-55 T9
0104	102181	POT 15T PC 1K 10% 3/8W CERM E	R38	1	73138	89PR1K
0105	116981	RES MF 6.34K .1W 1% 5PPM <.	R39	1	60393	PR1/10 TC5
0107	101562	RES CC1/4W 2.2K 5%	R41	1	01121	CB2225
0110	118821	RES WWPREC 10.00 1% 5W 5PPM NI	R44 *	1	12463	N5 9 10F C5
0119	101943	RES MF 150K .1W 1% 100PPM/C	R63	1	19701	MF5C-D-1503-F

TITLE A8, Fixed Local Oscillator Phase-Locked Loop PC Board Assembly 08319401 (Figure 5-14) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0120	101908	RES MF 499K .1W 1% 100PPM/C	R56	1	19701	5053YD4993F
0121	101598	RES CC 1/4W 4.7K 5%	R57	1	01121	CB4725
0122	101542	RES CC1/4W270 OHMS 5%	R58	1	01121	CB2715
0123	101689	RES CC1/4W750 OHMS 5%	R59	1	01121	CB7515
0124	640190	RES WW PWR10 10% 2W	R60	1	75042	BWH
0125	045276	IC ECL SSI10216 TRIPLE LINE RC	U1	1	04713	MC10216L
0126	045277	IC ECL 12040 PHASE-FREQ DET	U2	1	04713	MC12040L
0127	119975	IC OP AMP 5532 DUAL LOW NOISE	U3,8	2	18324	NE5532AN
0128	103943	IC LIN MSC LM311N COMPARATOR	U4	1	01295	SN72311P
0129	045265	IC VOLTREG8V 4% 1.5A TJ125C T	U9	1	07263	7808 UC
0130	117250	IC CMOS MSI IH5043 2 SPDT R=80	U6	1	32293	IH5043CPE
0131	117838	IC OP AMP AD542LH JFET A104DB	U7	1	24355	AD542LH
0134	100386	DIODE REF 6.2V .001%/C 1N827	VR1	1	99942	1N827
0136	103224	HEATSINK DIP .25W.75L.19H .02	*	2	13103	6011B
0138	118818	HEATSINK TO-202 .75L*.52W*.38	*	2	30161	5773B
0140	100482	TERM SWAGEBIFUR .062MAT.16HI.0		6	88245	2000B-1
0141	100496	TERM SWAGETURRET.062MAT.24HI.0	TP1,2	2	88245	1280B
0143	103352	INS XSTR TO-220 .61/.48W.75/.	*	2	08289	SK-73-48-13
0144	10062606	PHMS CRES 4-40 * 3/8	*	2	96906	MS51957-15
0145	103351	WSHR CPRSN.270D.12ID.05H CASE	*	2	04713	B52200F003
0146	100622	NUT HEX 4-40 .19AF .06THK SS	*	2	80205	NAS671C4
0150	067306	FAB COVER CAN DIV BY N(2)	*	1	52542	
0152	077227	FAB CAN MODIFICATION A8	*	1	52542	
0155	02134011	PC GUIDE SNAP IN .07BD 2.125L	*	2	52542	
0156	860013	SPACER M-F6-32 .38L,.25L MALE		4	06540	9738-SS-0632-3A
0157	100712	WSHR LOCK SPLIT #6	*	4	96906	MS35338-136
0158	100662	WSHR FLAT #6 .146 ID.270 OD CR	*	4	86928	5710-23-10
0159	10073104	FHMS CRES 6-32 * 1/4		4	96906	MS24693-C24
0162	100750	THERMAL COMPOUND FOR XSTR MTG.	*		05820	120-8
0163	10312601	ADHESIVE HI THERM COND EPOX	*			4951

SINGLE LEVEL EXPLOSION

TITLE A10, Divide-by-N PC Board Assembly 08318701 (Figure 5-16)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0001	708318701	SCH PCB DIVIDE BY N	REF		52542	
0003	2083187	A/W PCB DIVIDE BY N	REF		52542	
0004	083187	FAB PCB DIVIDE BY N		1	52542	
0007	100374	CAP C MOLD.01 UF 50V 10%	C1,2,7, 12,13,15 23-31	15	32159	8504BX103K
0010	100251	CAP C MOLD1000PF 50V 20%	C3,5,6, 14,16, 18-20,34 35,37,38 40,43-46	17	71590	CM15C102M
0014	103716	CAP TANT 1UF 35V 10%	C4,17	2	56289	196D105X9035HA1
0016	100178	CAP CER DP .1UF 50V 20% Z5U .3	C22,33 39,42	4	56289	2C37Z5U104M050B
0018	117783	CAP CER DP2.0NF 100V 5% COG .1	C9,10	2	51642	200-100-C0G202J
0019	117639	CAP CER DP 1000PF 100V 5% COG	C11,47	2	96733	DB45BY102J
0021	117358	CAP CER DP4.7PF 100V COG <.15W	C8	1	71590	CM10A4R7D
0022	103496	CAP TANT 22UF 10V 10% .26D*.4	C21	1	56289	196D226X9010JA1
0023	117631	CAP CER DP180PF 100V 5% COG .1	C32,41, 36	3	96733	DB44BY181J
0024	117567	CAP CER DP318PF 100V 1% COG .1	C49	1	96733	DB45BY3180F
0025	118817	CAP C MOLD159PF 100V 1% C0G <.	C50,51	2	04222	MR051A1590FAA
0028	100385	DIODE SIG 1N4151 50V	CR1,2	2	03508	1N4151
0029	123529	DIODE VCAP KV3201 11PF@3V 5PF@	CR3,4	2	50101	KV3201
0030	116527	DIODE VCAP32/26PF@3 6.5/5TR@25	CR5-8	4	04713	MV209
0034	101717	RES CC1/4W120 OHMS 5%	R1	1	01121	CB1215
0035	101609	RES CC 1/4W 100 OHM 5%	R2,54,73 74	4	01121	CB1015
0037	101729	RES CC1/4W 27 OHMS 5%	R3	1	0112	CB2705
0038	101711	RES CC1/8W1.0K 5%	R5,24, 50,59,72	5	01121	BB1025
0040	101710	RES CC1/8W560 OHMS 5%	R7-17,22 53,60,69	15	01121	BB5615
0042	101807	RES CC1/8W 18 OHMS 5%	R4,30,31 40,41,42	6	01121	BB1805
0045	101976	RES CC1/8W100K 5%	R6	1	01121	BB1045
0047	101709	RES CC1/8W470 OHMS 5%	R18,19	2	0112	BB4715
0048	101974	RES CC1/8W1.5K 5%	R20	1	01121	BB1525
0049	106190	RES MF 499 .12W 1% 50PPM	R21	1		RN60C4990F
0050	117587	RES MF 909 .1 W 1% 100PPM <	R25,26, 28,77	4		C=RN55D9090F
0051	106161	RES MF 1.00K .12W 1% 50PPM	R23,76	2		RN60C1001F
0052	119029	RES MF 7.87K .1W 1% 25PPM/C	R27,32	2	91637	CMF-55 T9
0053	101697	RES CC1/8W 10K 5%	R29,33 43-45,62 64,66	8	01121	BB1035
0055	101792	RES CC1/8W4.7K 5%	R35	1	01121	BB4725
0056	101694	RES CC1/8W 47K 5%	R36,63, 65,67	4	01121	BB4735
0058	101476	RES CC1/2W390 OHMS 5%	R37	1	01121	EB3915

TITLE A10, Divide-by-N PC Board Assembly 08318701 (Figure 5-16) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0059	101815	RES CC1/8W 51 OHMS 5%	R38,39 46,47	4	01121	BB5105
0062	101804	RES CC1/8W 510 OHMS 5%	R48	1	01121	BB5115
0063	101715	RES CC1/8W5.6K 5%	R49,52, 56,58,70 75	6	01121	BB5625
0067	101701	RES CC1/8W100 OHMS 5%	R51,55 57,61,68 71	6	01121	BB1015
0070	410048	RES MODULE 9-10K 2% .2W/R@75C	RN1	1	80294	4310R-101-103
0072	045239	IC ECL 10131 DUAL D M-S FLI	U1	1	04713	MC10131P
0073	103168	IC ECL SSI10106 4-3-3IN NOR GA	U2	1	04713	MC10106P
0074	045277	IC ECL 12040 PHASE-FREQ DET	U3	1	04713	MC12040L
0075	123544	IC OP AMP OP-27EN PRECISION UC	U4	1	24335	OP-27EN
0076	103027	IC ECL 10137P/L SYNC UP/DWN CN	U5,6,7	3	04713	MC10137P
0077	103416	IC ECL MSI11C90DC DIV 10/11 60	U8,9	2	07263	11C90DC
0078	116929	AMP HYBRD 0-400MHZ 14DB >8.2DB	U10	1	04713	MWA120
0079	025792	IC LIN MSCLM311 COMPARATOR DIF	U11	1	27014	LM311H
0080	117101	IC VOLTREG78L05 5V 5% <.4W@75C	U12	1	04713	MC78L05ACP
0082	103948	XSTR SI NPN BFR90 RF15V 25B250	Q1,2,5,6 8,9	6	04713	BFR90
0084	101377	XSTR SI NPN 2N3904 40V 100B300	Q3,4,7	3	04713	2N3904
0088	103224	HEATSINK DIP .25W.75L.19H .02	XU1-3, 5-9	8	13103	6011B
0090	100565	CON PC PINSINGLE MALE POST 10/	TP1	1	00779	86090-4
0094	067306	FAB COVER CAN DIV BY N(2)		1	52542	
0096	067305	CAN MW MODIFIED(5) 1618/1626		1	52542	
0098	02134011	PC GUIDE SNAP IN .07BD 2.125L		2	52542	
0100	103394	SPACER M-FSUB 860013		4	06540	9738-SS-0632
0102	100712	WSHR LOCK SPLIT #6		4	96906	MS35338-136
0104	100662	WSHR FLAT #6 .146 ID.270 OD CR		4	86928	5710-23-10
0106	10073103	FHMS CRES 6-32 x 3/16		4	96906	MS24693-C23
0110	102854	INDUCT FXD.27UH 20% Q47 F0250M	L1	1	00213	WEE-0.27
0112	101321	INDUCT FXD470UH 10% 50QMIN .12	L2,4	2	00213	WEE-WEE-470
0114	106688	IND FXD .56UH PHENOLIC CORE	L3	1	99800	1025-14
0116	103283	INDUCT FXD4.7UH 5%Q>44@7.9FR>7	L5	1	78526	SSD-4.7 5%
0118	101324	INDUCT FXD.33UH 10% 30QMIN .10	L6	1	06560	4416-7K
0122	10312601	ADHESIVE HI THERM COND EPOX		1		4951
0123	08371401	ASSY INDUCTOR ADJUSTABLE	L8		52542	
0124	08371402	ASSY INDUCTOR ADJUSTABLE	L7	1	52542	
0125	08371403	ASSY INDUCTOR ADJUSTABLE	L9	1	52542	

SINGLE LEVEL EXPLOSION

TITLE A11, 1 kHz Resolution Synthesizer PC Board Assembly 08361902 (Option 03) (Figure 5-18)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0004	708361901	SCH REF SYNTH 1KHZ RES PCB	REF A11		52542	
0005	2083619	ARTWORK PCB REF SYNTH 1KHZ RES	REF		52542	
0007	083619	FAB PCB REF SYNTH 1 KHZ RES		1	52542	
0009	117570	CAP CER DP .01 UF 100V 20% X7R	C1	1	04222	SR201C103MAA
0010	10010301	CAP C DISC.01UF 100V 80/-20% I	C2,7,8, 19,27,31 38	10	72982	DD560B10ZU103Z100V
0013	100251	CAP C MOLD1000PF 50V 20%	C5,6,12 14-16,18 20,23-26 28-30,32	16	71590	CM15C102M
0017	100178	CAP CER DP .1UF 50V 20% Z5U .3	C9,10,22	4	56289	2C37Z5U104M050B
0019	100176	CAP CER DP 1UF 50V 20% Z5U .38	C35	1	56289	2C37Z5U105M050B
0021	100183	CAP TANT 39UF 10V 10%	C13	1	56289	150D396X9010B2
0025	100186	CAP TANT 47UF 20V 10%	C17	1	56289	150D476X9020R2
0029	100225	CAP TANT 56UF 6V 10%	C21	1	56289	150D566X9006B2
0044	116906	DIODE VCAP115/105PF@4V 48.6/41	CR1,2	2	52673	KV2302A
0046	100385	DIODE SIG 1N4151 50V	CR3,4,7, 8	4	03508	1N4151
0048	100442	DIODE SIGL HP-2800 70V 100PS U	CR5,6,9	3	28480	5082-2800
0050	100390	DIODE ZENR 12V 5% .4W 1N963B	VR2	1	04713	1N963B
0056	102854	INDUCT FXD.27UH 20% Q47 F0250M	L3,5	2	00213	WEE-0.27
0057	101321	INDUCT FXD470UH 10% 50QMIN .12	L4	1	00213	WEE-WEE-470
0059	101317	INDUCT FXD10 UH 10% 51QMIN .12	L2	1	00213	WEE-WEE-10
0062	10141601	MOSFET NCHSPF759 2GT >13MS <3.	Q1	1	04713	SPF759
0063	102716	XSTR SIMPNPN4275 15V	Q2	1	07263	PN4275-18
0064	101378	XSTR SI PNP 2N3906 40V 100B300	Q3	1	04713	2N3906
0065	101396	XSTR SI NPN MPS-A12 DARLINGTON	Q4	1	04713	MPS-A12
0067	101584	RES CC1/4W 5.6K 5%	R1	1	01121	CB5625
0068	101601	RES CC1/4W 3.9K 5%	R2	1	01121	CB3925
0069	101598	RES CC 1/4W 4.7K 5%	R3,34	2	01121	CB4725
0070	101557	RES CC 1/4W 10 OHMS 5%	R4	1	01121	CB1005
0071	101569	RES CC 1/4W 1.0K 5%	R5,23,24 36,38	5	01121	CB1025
0072	101668	RES CC1/4W180 OHMS 5%	R6	1	01121	CB1815
0073	101583	RES CC1/4W 560 OHMS 5%	R7-17,21 22	13	01121	CB5615
0084	101625	RES CC1/4W470 OHMS 5%	R18,19, 42	3	01121	CB4715
0086	101556	RES CC1/4W1.3K 5%	R20	1	01121	CB1325
0091	101595	RES CC1/4W 8.2K 5%	R25,26	2	01121	CB8225
0093	101599	RES CC1/4W 2.7K 5%	R27,32, 35	3	01121	CB2725
0094	101574	RES CC1/4W 47K 5%	R33 R29	1	01121	CB4735
0099	101570	RES CC1/4W 10K 5%	R41,44	2	01121	CB1035
0100	101587	RES CC1/4W 27K 5%	R37	1	01121	CB2735
0101	101558	RES CC1/4W 100K 5%	R39	1	01121	CB1045
0102	101542	RES CC1/4W270 OHMS 5%	R40	1	01121	CB2715
0103	101672	RES CC1/4W 51 OHMS 5%	R43	1	01121	CB5105

TITLE A11, 1 kHz Resolution Synthesizer PC Board Assembly 08361902 (Option 03) (Figure 5-18) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0105	101697	RES CC1/8W 10K 5%	R45	1	01121	BB1035
0106	101694	RES CC1/8W 47K 5%	R46	1	01121	BB4735
0107	101792	RES CC1/8W4.7K 5%	R47	1	01121	BB4725
0108	101955	RES CC 1/8W 470K 5%	R48	1	01121	BB4745
0111	11938101	RES MODULE 7-10K 2% SIP .2H	RN1,2	2		108A10K
0112	119970	RES MODULE 4@10K 2% .2W/R@70C	RN3,4,5	3	80294	4308R-102-103
0116	045239	IC ECL 10131 DUAL D M-S FLI	U1	1	04713	MC10131P
0117	103168	IC ECL SSI10106 4-3-3IN NOR GA	U2	1	04713	MC10106P
0118	045277	IC ECL 12040 PHASE-FREQ DET	U3	1	04713	MC12040L
0119	117338	IC OP AMP LF355 88DB IB.2NA 5U	U4	1	27014	LF355N
0120	103027	IC ECL 10137P/L SYNC UP/DWN CN	U5-7	3	04713	MC10137P
0123	103416	IC ECL MSI11C90DC DIV 10/11 60	U8,9	2	07263	11C90DC
0125	025784	IC TTL MSI74196 PST DEC CNTR/L	U10	1	01295	SN74196N
0126	119976	IC TTL MSI74LS390 DUAL 4BIT DE	U11	1	01295	SN74LS390N
0127	045289	IC CMOS 14528 DUAL MONOSTBL	U12	1	04713	MC14528BCP
0128	116946	IC TTL SSI74LS132 4*2IN NAND S	U13	1	01295	SN74LS132N
0129	103943	IC LIN MSC LM311N COMPARATOR	U14	1	01295	SN72311P
0130	117101	IC VOLTREG78L05 5V 5% <.4W@75C	U15	1	04713	MC78L05ACP
0133	100496	TERM SWAGETURRET.062MAT.24HI.0	TP1	1	88245	1280B
0134	103224	HEATSINK DIP .25W.75L.19H .02	XU1-3, 5-10	9	13103	6011B
0135	101060	SPCR SWAGE2-56 .13L.16D.128MT.		4	71279	350-2188-09
0136	083190	FAB PCB SHIELD (SMALL)		1	52542	
0142	10070004	FHMS CRES 2-56X1/4		4	80205	NAS662C2R4

SINGLE LEVEL EXPLOSION

TITLE A12, 100 MHz Voltage-Controlled Crystal Oscillator PC Board Assembly 08319301 (Figure 5-20)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0003	708319301	SCH PCB 100MHZ VCXO	REF A12		52542	
0004	2083193	A/W PCB 100MHZ VCXO	REF		52542	
0006	083193	FAB PCB 100MHZ VCXO		1	52542	
0009	117633	CAP CER DP220PF 100V 5% COG .1	C1,3,14 C15,16 C21,26 C27,48	9	96733	DB44BY221J
0010	117639	CAP CER DP 1000PF 100V 5% COG	C2	1	96733	DB45BY102J
0012	117570	CAP CER DP .01 UF 100V 20% X7R	C4,6-8, 17,18,20 28-30,36 41,42-47 49	19	04222	SR201C103MAA
0013	100125	CAP TANT 22UF 15V 10%	C5	1	56289	150D226X9015B2
0017	117625	CAP CER DP56PF 100V 5% COG .1L	C9	1	96733	DB44BY560J
0018	117628	CAP CER DP100PF 100V 5% COG .1	C10,31 C32	3	96733	DB44BY101J
0019	117358	CAP CER DP4.7PF 100V COG <.15W	C11	1	71590	CM10A4R7D
0021	100304	CAP VARAIR1.7-11PF VERT ADJ	C13	1	74970	187-0106-005
0027	100262	CAP TANT 100UF 25V 10%	C19	1	56289	138D107X9025F2
0030	117624	CAP CER DP15PF 100V 5% COG .1L	C22-25	4	96733	DB44BY150J
0041	100178	CAP CER DP .1UF 50V 20% Z5U .3	C33,35	2	56289	2C37Z5U104M050B
0042	117641	CAP CER DP22PF 100V 5% COG .1L	C34	1	96733	DB44BY220J
0045	100183	CAP TANT 39UF 10V 10%	C37,39	2	56289	150D396X9010B2
0046	106514	CAP TANT 47UF 20V 20%	C38,40	2	56289	196D476X0020PE4
0047	117639	CAP CER DP 1000PF 100V 5% COG	C50	1	96733	DB45BY102J
0060	11963001	DIODE VCAP 1N5139 7.5/6.1@4 2.	CR1	1	04713	1N5139
0061	100395	DIODE ZENR 10V 5% .4W 1N961B	CR2	1	04713	1N961B
0062	100442	DIODE SIGL HP-2800 70V 100PS U	CR3,4	2	28480	5082-2800
0064	100385	DIODE SIG 1N4151 50V	CR5-7	3	03508	1N4151
0068	077211	CRYSTAL 100MHZ	Y1	1	52542	
0072	101293	RELAY REED5V R500 1FA .11A@28V	K1	1	15636	RA3023
0075	101311	INDUCT FXD.15UH 10% 38QMIN .10	L1	1	00213	DD-0.15
0076	101312	INDUCT FXD1.0UH 10% 50QMIN .16	L2,4,7,8	4	99800	1537-12
0077	101324	INDUCT FXD.33UH 10% 30QMIN .10	L3	1	06560	4416-7K
0079	106680	IND. FXD .22UH 10% PHENOL.	L5,6	2	99800	1025-04
0087	118950	RES MF 1.40K .1W 1% 25PPM/C	R1	1	91637	CMF-55 T9
0088	106358	RES MF 5.10K .12W .1% 50PPM	R2	1	14298	EE-1/8 RN60C
0089	101815	RES CC1/8W 51 OHMS 5%	R3,19	2	01121	BB5105
0090	103195	RES MF 200 1% .12W@125C 100	R4,5	2	19701	MF5C-0-2000F
0092	101569	RES CC 1/4W 1.0K 5%	R6,13,27 50,54,55	6	01121	CB1025
0093	101792	RES CC1/8W4.7K 5%	R7	1	01121	BB4725
0094	101834	RES CC1/8W 10 OHMS 5%	R8	1	01121	BB1005
0095	101719	RES CC1/8W2.2K 5%	R9,12,22 R24	4	01121	BB2225
0096	101701	RES CC1/8W100 OHMS 5%	R10,23	2	01121	BB1015
0097	101711	RES CC1/8W1.0K 5%	R11	1	01121	BB1025
0100	101710	RES CC1/8W560 OHMS 5%	R14,15	2	01121	BB5615
0102	101709	RES CC1/8W470 OHMS 5%	R16,18	4	0112	BB4715

TITLE A12, 100 MHz Voltage-Controlled Crystal Oscillator PC Board Assembly 08319301 (Figure 5-20) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
			R48			
			R51			
0103	101708	RES CC1/8W390 OHMS 5%	R17	1	01121	BB3915
0106	101672	RES CC1/4W 51 OHMS 5%	R20,21	2	01121	CB5105
0111	101615	RES CC1/4W 150 OHM 5%	R25	1	01121	CB1515
0112	101583	RES CC1/4W 560 OHMS 5%	R26,43	3	01121	CB5615
			R44			
0114	101595	RES CC1/4W 8.2K 5%	R28	1	01121	CB8225
0115	101608	RES CC1/4W 6.2K 5%	R29	1	01121	CB6225
0116	101570	RES CC1/4W 10K 5%	R30,37, 52,53,56 57	6	01121	CB1035
0118	101703	RES CC1/8W270 OHMS 5%	R31	1	01121	BB2715
0119	101609	RES CC 1/4W 100 OHM 5%	R33	1	01121	CB1015
0120	101558	RES CC1/4W 100K 5%	R34,35	2	01121	CB1045
0121	101598	RES CC 1/4W 4.7K 5%	R36	1	01121	CB4725
0122	101625	RES CC1/4W470 OHMS 5%	R46,47, 32	3	01121	CB4715
0124	101565	RES CC 1/4W 12K 5%	R38	1	01121	CB1235
0125	119111	RES MF 47.5K .1W 1% 25PPM/C	R39,42	2	91637	CMF-55 T9
0126	102114	RES MF 3.32K .12W 1% 100P	R40,41	2	91637	MFF-1/8 T1
0131	101577	RES CC1/4W 1.5K 5%	R45	1	01121	CB1525
0137	112155	XSTR SINPN2N5943 30V 25B300 >1	Q1	1	04713	2N5943
0138	101367	XSTR SI PNP PN3645 60V 80B240	Q2,11	2	07263	PN3645-18
0139	101358	XSTR SI NPN PN3643 30V 100B300	Q3	1	07263	PN3643-5
0140	101377	XSTR SI NPN 2N3904 40V 100B300	Q4	1	04713	2N3904
0141	103171	XSTR SINPN2N6304 15V 25B250@2M	Q5,6	2	04713	2N6304
0143	102716	XSTR SINPNPN4275 15V	Q7	1	07263	PN4275-18
0144	101396	XSTR SI NPN MPS-A12 DARLINGTON	Q8	1	04713	MPS-A12
0145	119183	MOSFET NCHAN VN-10KM 60V	Q9,10	2	17856	VN10KM
0146	025792	IC LIN MSCLM311 COMPARATOR DIF	U1,2	2	27014	LM311H
0148	103416	IC ECL MSI11C90DC DIV 10/11 60	U3	1	07263	11C90DC
0149	118742	IC OP AMP A88DB IB1.5UA <7NV/C	U4	1	18324	NE5534AN
0150	045277	IC ECL 12040 PHASE-FREQ DET	U5	1	04713	MC12040L
0151	045271	IC TTL SSI74S132 4X2IN NAND SC	U6	1	01295	SN74S132N
0155	077221	FAB CAN MODIFICATION A12	SEP P/L*	1	52542	
0156	077220	FAB MODIFICATION COVER A12	SEP P/L*	1	52542	
0157	02134011	PC GUIDE SNAP IN .07BD 2.125L	*	2	52542	
0158	117764	SPACER M-F6-32 5/8L .25L MALE	*	5	06540	9740-SS-0632
0159	103224	HEATSINK DIP .25W.75L.19H .02		2	13103	6011B
0160	10312601	ADHESIVE HI THERM COND EPOX				4951
0161	100712	WSHR LOCK SPLIT #6	*	5	96906	MS35338-136
0162	100662	WSHR FLAT #6 .146 ID.270 OD CR	*	5	86928	5710-23-10
0163	100666	INS XSTR TO-5 .350DIA X .125H		1	08289	501-000-0
0164	10073104	FHMS CRES 6-32 * 1/4	*	5	96906	MS24693-C24
0165	100575	TERM PRESSFDTH .086MTG .06MAT	TP1 *	1	98921	001-1007

SINGLE LEVEL EXPLOSION

TITLE A13, Output Phase-Locked Loop PC Board Assembly 08319201 (Figure 5-22)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0003	708319201	SCH PCB OUTPUT PLL	REF		52542	
0004	2083192	A/W PCB OUTPUT PLL	REF		52542	
0006	083192	FAB PCB OUTPUT PLL		1	52542	
0008	117568	CAP CER DP1000PF 100V 10% X7R	C1,2,4,5 C6,8,10 C12,13 C16,17	11	04222	3418100C102K
0010	100155	CAP C MOLD .1 UF 50V 10%	C3,7,9 C11,15 C23,24 C25	8	32159	G505BX104K
0021	117570	CAP CER DP .01 UF 100V 20% X7R	C14,18, 19-22,27 C31-37	14	04222	SR201C103MAA
0028	11228101	CAP TANT 22UF 25V 20% RDLD@.2	C26,28, 29	3		TAP822M25
0030	117629	CAP CER DP120PF 100V 5% COG .1	C38,39	2	96733	DB44BY121J
0039	100447	DIODE PIN 47273 <.3PF@50V R<5@	CR1,2,3	3	96067	MA47273
0042	100442	DIODE SIGL HP-2800 70V 100PS U	CR4,5	2	28480	5082-2800
0044	100385	DIODE SIG 1N4151 50V	CR6,7	2	03508	1N4151
0048	101542	RES CC1/4W270 OHMS 5%	R1,5,10	3	01121	CB2715
0049	101557	RES CC 1/4W 10 OHMS 5%	R2,6,15	3	01121	CB1005
0050	101577	RES CC1/4W 1.5K 5%	R3,4,7,8 R13,14 R17	7	01121	CB1525
0056	101540	RES CC1/2W 33 OHMS 5%	R9	1	01121	EB3305
0058	101569	RES CC 1/4W 1.0K 5%	R11	1	01121	CB1025
0059	101570	RES CC1/4W 10K 5%	R12,35	2	01121	CB1035
0063	101615	RES CC1/4W 150 OHM 5%	R16	1	01121	CB1515
0064	119187	RES, 442K. 1%. MF	R18	1	91637	CMF-55 T2
0065	106206	RES MF 10.2K .12W 1% 50PPM	R34	1		RN60C1002F
0066	123000	RES MF 150K 1% .1W 25PPM/C.14D	R19	1	91637	CMF-55 T9
0067	119079	RES MF 23.7K .1W 1% 25PPM/C	R20	1	91637	CMF-55 T9
0068	123142	RES MF 1.00K .1W 1% 25PPM/C	R21	1	91637	CMF-55 T9
0069	101672	RES CC1/4W 51 OHMS 5%	R22	1	01121	CB5105
0070	101536	RES CC1/4W330 OHMS 5%	R23	1	01121	CB3315
0071	101583	RES CC1/4W 560 OHMS 5%	R24,25	2	01121	CB5615
0072	118973	RES MF 2.37K .1W 1% 25PPM/C	R26,27, R39,40	4	91637	CMF-55 T9
0075	117576	RES MF 4.99K .1 W 1% 100PPM	R28,29	2		C=RN55D4991F
0077	101711	RES CC1/8W1.0K 5%	R30,31	2	01121	BB1025
0078	101976	RES CC1/8W100K 5%	R32	1	01121	BB1045
0080	119010	RES MF 5.23K .1W 1% 25PPM/C	R36	1	91637	CMF-55 T9
0081	119000	RES MF 4.22K .1W 1% 25PPM/C	R37,38	2	91637	CMF-55 T9
0083	101697	RES CC1/8W 10K 5%	R41	1	01121	BB1035
0085	101694	RES CC1/8W 47K 5%	R42	1	01121	BB4735
0089	101377	XSTR SI NPN 2N3904 40V 100B300	Q1	1	04713	2N3904
0090	101598	RES CC 1/4W 4.7K 5%	R33	1	01121	CB4725
0093	116929	AMP HYBRD 0-400MHZ 14DB >8.2DB	U1,2,3	3	04713	MWA120
0095	123543	IC OP AMP AD642KH DUAL FET INP	U5	1	24355	AD642KH

TITLE A13, Output Phase-Locked Loop PC Board Assembly 08319201 (Figure 5-22) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0096	116930	AMP HYBRD 0-400MHZ 14DB >18DBM	U4	1	04713	MWA130
0097	119975	IC OP AMP 5532 DUAL LOW NOISE	U8	1	18324	NE5532AN
0098	103416	IC ECL MSI11C90DC DIV 10/11 60	U6	1	07263	11C90DC
0099	045277	IC ECL 12040 PHASE-FREQ DET	U7	1	04713	MC12040L
0100	117101	IC VOLTREG78L05 5V 5% <.4W@75C	U11	1	04713	MC78L05ACP
0101	103943	IC LIN MSC LM311N COMPARATOR	U9	1	01295	SN72311P
0106	102879	JUMPER, 22AWG INSULATED .09D		1	55210	L-2007-1
0108	101117	MYLAR WSHR.225ID .363OD .007TH		4	86928	5622-26-7
0110	101260	RECEPT RF SUBMIN MALE PC MT SN	J1	1	98291	51-051-0000
0111	103224	HEATSINK DIP .25W.75L.19H .02		2	13103	6011B
0113	100496	TERM SWAGETURRET.062MAT.24HI.0	TP1	1	88245	1280B
0115	083440	FAB COVER CAN O/P PLL		1	52542	
0116	077227	FAB CAN MODIFICATION A8		1	52542	
0118	02134011	PC GUIDE SNAP IN .07BD 2.125L		2	52542	
0120	860013	SPACER M-F6-32 .38L,.25L MALE		4	06540	9738-SS-0632-3A
0122	100712	WSHR LOCK SPLIT #6		4	96906	MS35338-136
0123	100662	WSHR FLAT #6 .146 ID.270 OD CR		4	86928	5710-23-10
0125	10073104	FHMS CRES 6-32 x 1/4		4	96906	MS24693-C24
0126	10312601	ADHESIVE HI THERM COND EPOX				4951

SINGLE LEVEL EXPLOSION

TITLE A14, Reference Phase-Locked Loop PC Board Assembly 08319101 (Standard) (Figure 5-24)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0004	2083191	ARTWORK PCB REF PLL	REF		52542	
0005	708319101	SCH PCB REF PLL	REF		52542	
0007	083191	FAB PCB REF PLL		1	52542	
0011	117570	CAP CER DP .01 UF 100V 20% X7R	C50	1	04222	SR201C103MAA
0020	117623	CAP CER DP 12PF 100V 5% C	C2	1	96733	DB44BY120J
0021	100155	CAP C MOLD .1 UF 50V 10%	C1,11, 23-29,31 33,34,36 40-42,46 49,51,52	20	32159	8505BX104K
0022	11228101	CAP TANT 22UF 25V 20% RDLD@.2	C12-14, 21	4		TAPB22M25
0025	11979701	CAP CER DP .022UF 50V 10% X7R	C15,17	2	71590	CW20C223K
0032	117568	CAP CER DP1000PF 100V 10% X7R	C22	1	04222	3418100C102K
0033	10371501	CAP TANT 10UF 20V 10% LONG LEA	C35,44	2	56289	196D106X9020JA1
0035	103716	CAP TANT 1UF 35V 10%	C43	1	56289	196D105X9035HA1
0037	100176	CAP CER DP 1UF 50V 20% Z5U .38	C47,48	2	56289	2C3Z5U105M050B
0040	106680	IND. FXD .22UH 10% PHENOL.	L1	1	99800	1025-04
0047	100385	DIODE SIG 1N4151 50V	CR1,5-8	5	03508	1N4151
0048	100442	DIODE SIGL HP-2800 70V 100PS U	CR2,3	2	28480	5082-2800
0063	106587	XSTR SINPN2N2219A W/HEAVY KOVA	Q3	1	07263	2N2219A SF HDR
0064	705067	XSTR SIPNP 2N2905A 60V 100B300	Q4	1		2N2905AS
0068	101542	RES CC1/4W270 OHMS 5%	R1	1	01121	CB2715
0071	101569	RES CC 1/4W 1.0K 5%	R5,41,42	3	01121	CB1025
0072	101672	RES CC1/4W 51 OHMS 5%	R2,3	2	01121	CB5105
0076	101702	RES CC1/8W150 OHMS 5%	R7,8	2	01121	BB1515
0081	119026	RES 7.50K 1% MF	R11,12	2	91637	CMF-55 T9
0083	101587	RES CC1/4W 27K 5%	R13	1	01121	CB2735
0084	117594	RES MF 681 .1 W 1% 100PPM <	R14,19	2		C=RN55D6810F
0085	101558	RES CC1/4W 100K 5%	R16,17, 43	3	01121	CB1045
0087	101597	RES CC1/4W 68K 5%	R15,18	2	01121	CB6835
0093	101697	RES CC1/8W 10K 5%	R23,44	2	01121	BB1035
0100	106032	RES CC 1W 51 OHMS 5%	R30	1	01121	GB5105
0101	101625	RES CC1/4W470 OHMS 5%	R33,31	2	01121	CB4715
0102	101577	RES CC1/4W 1.5K 5%	R32	1	01121	CB1525
0105	101609	RES CC 1/4W 100 OHM 5%	R35,36	2	01121	CB1015
0107	119025	RES MF 7.32K .1W 1% 25PPM/C	R34,37	2	91637	CMF-55 T9
0108	101784	RES CC1/4W2.7 OHMS 5%	R38,39	2	01121	CB2765
0110	101689	RES CC1/4W750 OHMS 5%	R40	1	01121	CB7515
0112	101574	RES CC1/4W 47K 5%	R45	1	01121	CB4735
0114	101598	RES CC 1/4W 4.7K 5%	R46	1	01121	CB4725
0120	045276	IC ECL SSI10216 TRIPLE LINE RC	U1	1	04713	MC10216L
0121	045277	IC ECL 12040 PHASE-FREQ DET	U2	1	04713	MC12040L
0122	119975	IC OP AMP 5532 DUAL LOW NOISE	U3	1	18324	NE5532AN
0124	103943	IC LIN MSC LM311N COMPARATOR	U4,12	2	01295	SN72311P
0126	103164	IC TTL MSI74LS196 PRST BCD CNT	U6	1	01295	SN74LS196N
0128	055066	RES MODULE4-560 20% >.1W .53H.	U8,9	2	52542	MRG-C-SY-560-K
0129	045265	IC VOLTREG8V 4% 1.5A TJ125C T	U10	1	07263	7808 UC
0130	117413	IC VOLTREG7908 -8.4/-7.6V <1A	U11	1	04713	MC7908CT

TITLE A14, Reference Phase-Locked Loop PC Board Assembly 08319101 (Standard) (Figure 5-24) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0140	101260	RECEPT RF SUBMIN MALE PC MT SN	J1	1	98291	51-051-0000
0141	103224	HEATSINK DIP .25W.75L.19H .02		4	13103	6011B
0142	100482	TERM SWAGEBIFUR .062MAT.16HI.0		6	88245	2000B-1
0143	100496	TERM SWAGETURRET.062MAT.24HI.0	TP1	1	88245	1280B
0145	103352	INS XSTR TO-220 .61/.48W.75/.		1	08289	SK-73-48-13
0146	10062606	PHMS CRES 4-40 x 3/8		1	96906	MS51957-15
0147	103351	WSHR CPRSN.270D.12ID.05H CASE		1	04713	B52200F003
0148	100707	NUT HEX 4-40 .25AF .09THK SS		1	96906	MS35649-244
0149	067307	FAB COVER CAN PLL(3)		1	52542	
0151	067305	CAN MW MODIFIED(5) 1618/1626		1	52542	
0154	02134011	PC GUIDE SNAP IN .07BD 2.125L		2	52542	
0155	117764	SPACER M-F6-32 5/8L .25L MALE		4	06540	9740-SS-0632
0156	100712	WSHR LOCK SPLIT #6		4	96906	MS35338-136
0157	100662	WSHR FLAT #6 .146 ID.270 OD CR		4	86928	5710-23-10
0158	10073103	FHMS CRES 6-32 x 3/16		4	96906	MS24693-C23
0160	10312601	ADHESIVE HI THERM COND EPOX		1		4951

SINGLE LEVEL EXPLOSION

TITLE A14, Reference Phase-Locked Loop PC Board Assembly 08319102 (Option 03) (Figure 5-26)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0004	2083191	ARTWORK PCB REF PLL	REF		52542	
0005	708319101	SCH PCB REF PLL	REF		52542	
0007	083191	FAB PCB REF PLL		1	52542	
0011	117570	CAP CER DP .01 UF 100V 20% X7R	C50	1	04222	SR201C103MAA
0020	117623	CAP CER DP 12PF 100V 5% C	C2	1	96733	DB44BY120J
0021	100155	CAP C MOLD .1 UF 50V 10%	C11, 23-29,31 33,34,36 40-42, 49,51,52	18	32159	6505BX104K
0022	11228101	CAP TANT 22UF 25V 20% RDLD@.2	C12-14, 21	4		TAPB22M25
0025	11979701	CAP CER DP .022UF 50V 10% X7R	C15,17	2	71590	CW20C223K
0032	117568	CAP CER DP1000PF 100V 10% X7R	C22	1	04222	3418100C102K
0033	10371501	CAP TANT 10UF 20V 10% LDWG LEA	C35,44	2	56289	196D106X9020JA1
0035	103716	CAP TANT 1UF 35V 10%	C43	1	56289	196D105X9035HA1
0037	100176	CAP CER DP 1UF 50V 20% Z5U .38	C47,48	2	56289	2C3775U105M050B
0040	106680	IND. FXD .22UH 10% PHENOL.	L1	1	99800	1025-04
0047	100385	DIODE SIG 1N4151 50V	CR1,5-8	5	03508	1N4151
0048	100442	DIODE SIGL HP-2800 70V 100PS U	CR2,3	2	28480	5082-2800
0063	106587	XSTR SINPN2N2219A W/HEAVY KOVA	Q3	1	07263	2N2219A SF HDR
0064	705067	XSTR SIPNP 2N2905A 60V 1008300	Q4	1		2N2905AS
0068	101542	RES CC1/4W270 OHMS 5%	R1	1	01121	CB2715
0071	101569	RES CC 1/4W 1.0K 5%	R41,42	2	01121	CB1025
0076	101702	RES CC1/8W150 OHMS 5%	R7,8	2	01121	BB1515
0081	119026	RES 7.50K 1% MF	R11,12	2	91637	CMF-55 T9
0083	101587	RES CC1/4W 27K 5%	R13	1	01121	CB2735
0084	117594	RES MF 681 .1 W 1% 100PPM <	R14,19	2		C=RN55D6810F
0085	101558	RES CC1/4W 100K 5%	R16,17, 43	3	01121	CB1045
0087	101597	RES CC1/4W 68K 5%	R15,18	2	01121	CB6835
0093	101697	RES CC1/8W 10K 5%	R23,44	2	01121	BB1035
0100	106032	RES CC 1W 51 OHMS 5%	R30	1	01121	GB5105
0101	101625	RES CC1/4W470 OHMS 5%	R33,31	2	01121	CB4715
0102	101577	RES CC1/4W 1.5K 5%	R32	1	01121	CB1525
0105	101609	RES CC 1/4W 100 OHM 5%	R35,36	2	01121	CB1015
0107	119025	RES MF 7.32K .1W 1% 25PPM/C	R34,37	2	91637	CMF-55 T9
0108	101784	RES CC1/4W2.7 OHMS 5%	R38,39	2	01121	CB2765
0110	101689	RES CC1/4W750 OHMS 5%	R40	1	01121	CB7515
0112	101574	RES CC1/4W 47K 5%	R45	1	01121	CB4735
0114	101598	RES CC 1/4W 4.7K 5%	R46	1	01121	CB4725
0120	045276	IC ECL SSI10216 TRIPLE LINE RC	U1	1	04713	MC10216L
0121	045277	IC ECL 12040 PHASE-FREQ DET	U2	1	04713	MC12040L
0122	119975	IC OP AMP 5532 DUAL LOW NOISE	U3	1	18324	NE5532AN
0124	103943	IC LIN MSC LM311N COMPARATOR	U4	1	01295	SN72311P
0126	103164	IC TTL MSI74LS196 PRST BCD CNT	U6	1	01295	SN74LS196N
0128	055066	RES MODULE4-560 20% >.1W .53H.	U8,9	2	52542	MRG-C-5Y-560-K
0129	045265	IC VOLTREG8V 4% 1.5A TJ125C T	U10	1	07263	7808 UC
0130	117413	IC VOLTREG7908 -8.4/-7.6V <1A	U11	1	04713	MC7908CT
0140	101260	RECEPT RF SUBMIN MALE PC MT SN	J1	1	98291	51-051-0000

TITLE A14, Reference Phase-Locked Loop PC Board Assembly 08319102 (Option 03) (Figure 5-26) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0141	103224	HEATSINK DIP .25W.75L.19H .02		4	13103	6011B
0142	100482	TERM SWAGEBIFUR .062MAT.16HI.0		6	88245	2000B-1
0143	100496	TERM SWAGETURRET.062MAT.24HI.0	TP1	1	88245	1280B
0145	103352	INS XSTR TO-220 .61/.48W.75/.		1	08289	SK-73-48-13
0146	10062606	PHMS CRES 4-40 x 3/8		1	96906	MS51957-15
0147	103351	WSHR CPRSN.270D.12ID.05H CASE		1	04713	B52200F003
0148	100707	NUT HEX 4-40 .25AF .09THK SS		1	96906	MS35649-244
0149	067307	FAB COVER CAN PLL(3)		1	52542	
0151	067305	CAN MW MODIFIED(5) 1618/1626		1	52542	
0154	02134011	PC GUIDE SNAP IN .078D 2.125L		2	52542	
0155	117764	SPACER M-F6-32 5/8L .25L HALE		4	06540	9740-SS-0632
0156	100712	WSHR LOCK SPLIT #6		4	96906	MS35338-136
0157	100662	WSHR FLAT #6 .146 ID.270 OD CR		4	86928	5710-23-10
0158	10073103	PHMS CRES 6-32 x 3/16		4	96906	MS24693-C23
0159	102879	JUMPER, 22AWG INSULATED .09D	W1	1	55210	L-2007-1
0160	10312601	ADHESIVE HI THERM COND EPOX		1		4951

SINGLE LEVEL EXPLOSION

TITLE A15, Display Interface PC Board Assembly 08316501 (Figure 5-28)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0001	708316501	SCH PCB DISPLAY INTERFACE	REF		52542	
0002	2083165	A/W PCB DISPLAY INTERFACE	REF		52542	
0003	083165	FAB PCB DISPLAY INTERFACE		1	52542	
0004	08316401	ASSY PCB DISPLAY	A15-A1	1	52542	
0005	100155	CAP C MOLD .1 UF 50V 10%	C1	1	32159	6505BX104K
0006	117570	CAP CER DP .01 UF 100V 20% X7R	C3-19	17	04222	SR201C103MAA
0007	100251	CAP C MOLD1000PF 50V 20%	C2	1	71590	CM15C102M
0009	11228101	CAP TANT 22UF 25V 20% RDLD@.2	C20	1		TAP822M25
0015	117340	CON PC PIN2*13 HEADER .25SQ .1	J1-3	3	30146	922584-26
0016	11947401	CONN PC 4 PIN RT ANGLAR .1C-C	J5	1	27264	22-05-3041
0017	123394	CON PC PIN 2*5 RTANG HDR .1C-C	J4	1	53387	3446-1202
0018	106673	INDUCT FXD 3.6UH 850 OHM .240	L1	1		VK200-20/4B
0019	119255	RES MODULE 9-10K 2% .25W/R 10S	RN1-4	4	01121	410103
0020	11938101	RES MODULE 7-10K 2% SIP .2H	RN5-6	2		108A10K
0021	101630	RES CC1/4W 470K 5%	R1	1	01121	CB4745
0022	101711	RES CC1/8W1.0K 5%	R3-5	3	01121	BB1025
0023	101570	RES CC1/4W 10K 5%	R2	1	01121	CB1035
0025	123448	SW PB ASSY MOMEN W/LIGHT PIPE	S1,4,5, 10,13, 14-18,24 25,29,30	14		39-22102
0026	123523	NON-ILLUM PUSHBUTTON SWITCH	S2,3,6-9 11,12, 19-23, 26-28, 31-35	21		39-22500
0034	118700	SN74LS348N	U1-6	6	01295	SN74LS348N
0036	116948	IC CMOS 14538 2*MONOMULIV1B	U7	1	04713	MC14538BCP
0038	045283	IC CMOS 4001 QUAD-2IN NOR GA	U8	1	04713	MC14001BCP
0040	117509	IC TTL MSI74LS373 8*TRANS D LC	U9	1	01295	SN74LS373N
0042	116516	IC CMOS 14174 6*D FLIP/FLOP	U10	1	04713	MC14174BCP
0044	117508	IC TTL MSI74LS244 8BFR 2ENBL L	U11	1	01295	SN74LS244N
0046	117115	IC CMOS 4067 16CHAN MUX/DEMU	U12	1	02735	CD4067BE
0048	116492	IC CMOS 14556 2*BIN 1/4 DCD/	U13	1	04713	MC14556BCP
0050	103940	IC CMOS SS4071 4 2IN OR 14DIP	U15	1	04713	MC14071BCP
0052	117952	IC CMOS ICM7218EIJL 8DIG LED D	U16	1	32293	ICM7218EIJL
0059	103845	SOCKET IC 24PIN .7W(.6S)X1.22	XU12	1	71279	703-1324-01-04-10
0061	117159	SOCKET IC 40PIN .7W(.6SP)X2.02	XU16	1	71279	703-1340-01-04-10
0069	08331301	SPEC KEYCAP LEGEND(1 SET 1720)		1	52542	
0070	083313	SPEC KEYCAP LEGEND	REF		52542	

SINGLE LEVEL EXPLOSION

TITLE A15A1, Display PC Board Assembly 08316401 (Figure 5-29)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0002	708316501	SCH PCB DISPLAY INTERFACE	REF		52542	
0003	2083164	ARTWORK PCB DISPLAY	REF		52542	
0005	083164	FAB PCB DISPLAY		1	52542	
0010	117570	CAP CER DP .01 UF 100V 20% X7R	C1-18	18	04222	SR201C103MAA
0012	11228101	CAP TANT 22UF 25V 20% RDLD@.2	C19	1		TAPB22M25
0014	106673	INDUCT FXD 3.6UH 850 OHM .240	L1	1		VK200-20/4B
0016	106546	DISPL 7SEG1 CHAR .27 IN 16 DIP	DS1-18	18	01295	TIL 308
0018	117519	DISPL 5SE6+1-,1 .27H	DS19	1		TIL304
0020	116530	CON PC PIN2*13SKT .025 .1C-C .	J1,2,3	3	22526	65781-013
0023	117041	SOCKET IC 16PIN .4W(.3SP)X .82	XDS1-15, 17-19	18	71279	703-1316-01-04-10
0025	117040	SOCKET IC 14PIN .4W(.3SP)X .72	XDS16	1	71279	703-1314-01-04-10
0027	116936	SPCR SNAGE6 .06MAT .437L*.25D		2	06540	9536B-A-140-17

SINGLE LEVEL EXPLOSION

TITLE A16, Analog-to-Digital and Multiplexer PC Board Assembly 08317601 (Figure 5-31)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0003	708317601	SCH PCB A TO D MULTIPLXR	REF		52542	
0005	2083176	A/W PCB A TO D MULTIPLXR	REF		52542	
0008	083176	FAB PCB A TO D MULTIPLXR		1	52542	
0015	100176	CAP CER DP 1UF 50V 20% Z5U .38	C1,2, 17-22	8	56289	2C37Z5U105M050B
0017	100155	CAP C MOLD .1 UF 50V 10%	C7-10 C23,24	6	32159	65058X104K
0019	103716	CAP TANT 1UF 35V 10%	C3,4	2	56289	196D105X9035HA1
0021	100199	CAP MYLAR .1UF 200V 10%	C5,6	2	56289	192P10492
0024	117570	CAP CER DP .01 UF 100V 20% X7R	C11,12	2	04222	SR201C103MAA
0025	106513	CAP TANT 4.7UF 20V 20% RAD LE	C13-16	4	56289	196D475X0035JA1
0030	100442	DIODE SIGL HP-2800 70V 100PS U	CR1-6	6	28480	5082-2800
0036	101701	RES CC1/8W100 OHMS 5%	R1,16	2	01121	BB1015
0038	102015	RES CC1/8W560K 5%	R2,4,17, 19	4	01121	BB5645
0040	102241	POT 15T PC 2M 20% 3/8W CERM E	R3,18	2	73138	89PR2M
0042	119053	RESISTOR, RN55E1372F	R5	1	91637	CMF-55 T9
0044	118990	RES MF 3.40K .1W 1% 25PPM/C	R6	1	91637	CMF-55 T9
0046	101688	RES CC1/4W620 OHMS 5%	R7	1	01121	CB6215
0048	101672	RES CC1/4W 51 OHMS 5%	R8	1	01121	CB5105
0050	101630	RES CC1/4W 470K 5%	R9	1	01121	CB4745
0052	101620	RES CC1/4W 300K 5%	R10	1	01121	CB3045
0054	101697	RES CC1/8W 10K 5%	11-15,20 21	7	01121	BB1035
0060	116590	IC OP AMP TL074 4JFET A68DB 10	U1	1	01295	TL074CN
0062	118743	I.C. MC14051BCP	U2	1	04713	MC14051BCP
0064	117326	IC DVM MC14433 3.5DIG DVM +-2V	U3	1	04713	MC1443JP
0066	117101	IC VOLTREG78L05 5V 5% <.4W@75C	U4	1	04713	MC78L05ACP
0068	117014	IC VOLTREG 79L05 -4.8V/-5.2V	U5	1	04713	MC79L05ACP
0070	118868	IC VOLTREF AD581LH TO5	U6	1	24355	AD581LH
0072	119975	IC OP AMP 5532 DUAL LOW NOISE	U7	1	18324	NE5532AN

SINGLE LEVEL EXPLOSION

TITLE A19/A20, Sampler Driver PC Board Assembly 08337601 (Figure 5-33)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0003	708337601	SCH PCB SAMPLER DRIVER	REF		52542	
0004	2083376	A/W PCB SAMPLER DRIVER	REF		52542	
0006	083376	FAB PCB SAMPLER DRIVER		1	52542	
0008	117471	CAP CER DP33PF 100V 5% COG .1L	C1	1	96733	DB44BY330J
0009	117626	CAP CER DP68PF 100V 5% COG .1L	C7	1	96733	DB44BY680J
0010	100176	CAP CER DP 1UF 50V 20% Z5U .3B	C3,8	2	56289	2C3Z5U105M050B
0011	117568	CAP CER DP1000PF 100V 10% X7R	C4,5,10	3	04222	341B100C102K
0013	100135	CAP VARCER9.0-35PF MIN. PC	C6	1	72982	538-011B9.0-35
0016	100234	CAP VARCER15-60PF MIN. PC	C9	1	59660	538-011F15-60
0018	117570	CAP CER DP .01 UF 100V 20% X7R	C11,12	2	04222	SR201C103MAA
0024	101311	INDUCT FXD.15UH 10% 38@MIN .10	L2	1	00213	DD-0.15
0025	PHANTOM 06776104	SPEC INDUCTOR WIRE 4 TURNS	L3	1	52542	
0026	101312	INDUCT FXD1.0UH 10% 50@MIN .16	L4	1	99800	1537-12
0034	101716	RES CC 1/8W 6.8K 5%	R1	1	01121	BB6825
0035	101719	RES CC1/8W2.2K 5%	R2	1	01121	BB2225
0036	101668	RES CC1/4W180 OHMS 5%	R3	1	01121	CB1815
0037	101819	RES CC1/8W 12 OHMS 5%	R4	1	01121	BB1205
0038	101615	RES CC1/4W 150 OHM 5%	R5	1	01121	CB1515
0039	101969	RES CC1/8W1.2K 5%	R6	1	01121	BB1225
0040	101702	RES CC1/8W150 OHMS 5%	R7	1	01121	BB1515
0041	101733	RES CC1/4W 39 OHMS 5%	R8	1	01121	CB3905
0042	101764	RES CC1/4W 15 OHMS 5%	R9	1	01121	CB1505
0043	101735	RES CC1/4W 56 OHMS 5%	R10	1	0112	CB5605
0047	103171	XSTR SINPN2N6304 15V 25B250@2M	Q1	1	04713	2N6304
0049	100482	TERM SWAGEBIFUR .062MAT.16HI.0		6	88245	2000B-1
0051	100511	SPCR SWAGE6-32 .188L X.25RND .		2	88245	1530 B 3/16
0053	103513	TAPE ADHES2.2 MIL X 1/4 IN 130		1	26066	SCOTCH@1286 1/4
0054	077211	CRYSTAL 100MHZ	Y1	1	52542	

SINGLE LEVEL EXPLOSION

TITLE A19/A20, Sampler Driver PC Board Assembly 08337601 (Figure 5-33) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0003	08337601	ASSY PCB SAMPLER		1	52542	
0004	10062604	PHMS CRES 4-40 x 1/4		4	96906	MS51957-13
0005	116947	EXT TOOTH #4 CRES		4	96906	MS-35335-57
0006	10072004	FHMS CRES 4-40X1/4		5	96906	MS24693-C2
0007	10073104	FHMS CRES 6-32 x 1/4		2	96906	MS24693-C24
0008	112654	L BRACKET 1/4WX5/16L.136HOLE7/		4	79963	676
0009	100711	WSHR LOCK SPLIT #4		4	96906	MS35338-135
0010	100622	NUT HEX 4-40 .19AF .06THK SS		4	80205	NAS671C4
0011	101251	RECEPT RF SMB JACK REARMT SNAP	J1,2	2	98291	51-043-4300
0012	103343	FILTER RFI10A 200V 10DB10MHZ 5	Z1	1	33095	51-744-016
0013	103335	XSTP SINPNBFR95 25V B>30@.15A	Q2	1	25403	BFR95
0014	103079	HEATSINK TO-5 .46H*.37AF 4-40		1	05820	2604TH5B
0015	067674	FAB BASE SAMPLER DRIVER		1	52542	
0016	077213	FAB DRIVER SAMPLER COVER		1	52542	
0020	708337601	SCH PCB SAMPLER DRIVER	REF		52542	

SINGLE LEVEL EXPLOSION

ITEM A23 Pulse Modulator Driver PC Board Assembly 04300101 (Standard Figure 5-35)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0002	7002300101	SCHEM PCB MODULATOR DRIVER	REF		52542	
0004	2002301	ARTWORK PCB MODULATOR DRIVER	REF		52542	
0006	002301	FAB A23 PULSE MOD DRIVER PCB		1	52542	
			C1,6,9,		52542	
			C16		52542	
0018	117640	CAP CER DP 27PF 100V 5% COG .1	C11-14	4	96733	DB44BY270J
0022	117570	CAP CER DP .01 UF 100V 20% X7R	C15,18	18	04222	SR201C103MAA
			C19-22			
			C25-29			
			C32-38			
0023	100174	CAP CER DP 1UF 50V 20% Z5U .38	C16	1	56289	2C37Z5U105M050B
0024	102716	CAP TANT 1UF 35V 10%	C17,24	2	56289	196D105X9035HA1
0030	102496	CAP TANT 22UF 10V 10% .26D*.4	C23,30	2	56289	196D226X9010JA1
0044	106514	CAP TANT 47UF 20V 20%	C39	1	56289	196D476X0020PE4
0052	100285	DIODE SIB 1N4151 50V	CR1-4,7	8	03508	1N4151
			CR11-13			
0057	100442	DIODE SIGL HP-2800 70V 100PS U	CR5,6,8	4	28480	5082-2800
			CR9			
0060	100443	DIODE SGNL1N4829 20V 1.87V FW	CR10	1	03508	1N4829
0070	027592	ISTR SINPN2N4275 SEL VCE0=20V	Q1,6	2	52542	
0071	101378	ISTR SI PNP 2N3906 40V 100B300	Q2,4,5	3	04713	2N3906
0072	101377	ISTR SI NPN 2N3904 40V 100B300	Q3	1	04713	2N3904
0076	101367	ISTR SI PNP PN3645 60V 80B240	Q7	1	07263	PN3645-18
0077	117349	ISTR SIPNPMPS-A63 30V H>5K@10M	Q8	1	04713	MPS-A63
0088	101574	RES CC1/4W 47K 5%	R1	1	01121	CB4735
0089	101558	RES CC1/4W 100K 5%	R2	1	01121	CB1045
0090	101735	RES CC1/4W 56 OHMS 5%	R3,4,33,	4	0112	CB5605
			R44			
0092	101581	RES CC1/4W 1.2K 5%	R5	1	01121	CB1225
0093	102163	POT 4T PC500 20% 1/2W CERM T	R6,8,10	6	'C'	TM-7W-500 OHMS
			R12,14			
			R16			
0094	117576	RES MF 4.99K .1 W 1% 100PPM	R7,9,11,	8		C=RN55D4991F
			R13,15			
			17,22,23			
0111	101536	RES CC1/4W330 OHMS 5%	R24,25	3	01121	CB3315
			R27			
0113	101625	RES CC1/4W470 OHMS 5%	R26,35	3	01121	CB4715
			R36			
0115	117588	RES MF 33.2 .1 W 1% 100PPM	R28	1		C=RN55D33R2F
0116	620268	RES MF 953 .13W 1% 100PPM	R29	1		C=RN60D9530F
0117	103195	RES MF 200 1% .12W@125C 100	R30	1	19701	MF5C-D-2000F
0118	117594	RES MF 681 .1 W 1% 100PPM <	R31	1		C=RN55D6810F
0119	101485	RES CC1/2W270 OHMS 5%	R32	1	01121	EB2715
0124	101567	RES CC1/4W 820 OHM 5%	R37	1	01121	CB8215
0125	101566	RES CC1/4W 220 OHM 5%	R38	1	01121	CB2215
0126	101542	RES CC1/4W270 OHMS 5%	R39	1	01121	CB2715
0127	103194	RES MF 806 1% .12W@125C 100	R40	1	91637	CMF-60 T1
0128	119155	RES MF 1.87K .1W 1% 25PPM/C	R41	1	91637	CMF-55 T9
0129	117589	RES MF 100 .1 W 1% 100PPM <	R34,42	2		C=RN55D1000F

TITLE A23, Pulse Modulator Driver PC Board Assembly 08330101 (Standard) (Figure 5-35) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0130	102133	RES MF 63.4 .12W 1% 100P	R43	1	91637	CMF-60 T1
0132	101508	RES CC1/2W120 OHMS 5%	R45	1	0112	EB1215
0133	101509	RES CC1/2W 27 OHMS 5%	R46,49	2	01121	EB2705
0134	118859	RES MF 294OHMS.1W 1% 50PPM (.1	R47	1	16299	MC55 294 1%
0135	117818	RES MF 4990HMS.1 W 1% 100 PPM	R48,51	2		C=RN55D4990F
0137	103018	RES MF 255 .12W 1% 25PP	R50	1	91637	MFF 1/8 T9
0140	101598	RES CC 1/4W 4.7K 5%	R54	1	01121	CB4725
0142	101552	RES CC1/4W 15K 5%	R55	1	01121	CB1535
0156	103749	IC TTL SSI74LS04 HEI INV (20NS	U1	1	01295	SN74LS04N
0157	103217	IC CMOS 4049 HEI INV BUFF LT	U2	1	02735	MC14049BCP
0158	103937	IC CMOS SS4011 4 2IN NAND 14DI	U3	1	04713	MC14011BCP
0159	103938	IC CMOS SS4012 2 4IN NAND 14DI	U4	1	04713	MC14012BCP
0160	103976	IC TTL SSI74LS123 DUAL RETRIG	U5-7,11	4	01295	SN74LS123N
0164	118879	IC TTL SSI74LS126A 4#3ST BUF H	U9,10	2	01295	SN74LS126AN
0168	117056	IC TTL MSI74LS279 4 ^S/^R LATC	U12	1	01295	SN74LS279N
0169	117014	IC VOLTREG 79L05 -4.8V/-5.2V	U13	1	04713	MC79L05ACP
0170	117101	IC VOLTREG7BL05 5V 5% (.4W@75C	U14	1	04713	MC7BL05ACP
0171	057913	RES MODULE4-100K 20% >.1W .5JH	U16	1	52542	MRG-C-5Y-100K-K

SINGLE LEVEL EXPLOSION

TITLE A23, Pulse Modulator Driver PC Board Assembly 08330102 (Option S6002) (Figure 5-36)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0003	708330102	SCHEM PCB MODULATOR DRIVER	REF		52542	
0004	2083301	ARTWORK PCB MODULATOR DRIVER	REF		52542	
0006	083301	FAB A23 PULSE MOD DRIVER PCB		1	52542	
			C1,6,9,		52542	
			C10		52542	
0018	117640	CAP CER DP 27PF 100V 5% COG .1	C11-14	4	96733	DB44BY270J
0022	117570	CAP CER DP .01 UF 100V 20% X7R	C15,18	18	04222	SR201C103MAA
			C19-22			
			C25-29			
			C32-38			
0023	100176	CAP CER DP 1UF 50V 20% Z5U .38	C16	1	56289	2C37Z5U105M050B
0024	103716	CAP TANT 1UF 35V 10%	C17,24	2	56289	196D105X9035HA1
0030	103496	CAP TANT 22UF 10V 10% .26D#.4	C23,30	2	56289	196D226X9010JA1
0046	106514	CAP TANT 47UF 20V 20%	C39	1	56289	196D476X0020PE4
0053	100385	DIODE SIG 1N4151 50V	CR3,4,7	6	03508	1N4151
			CR11-13			
0057	100442	DIODE SIGL HP-2800 70V 100PS U	CR5,6,8	4	28480	5082-2800
			CR9			
0060	100443	DIODE SGNL1N4829 20V 1.87V FW	CR10	1	03508	1N4829
0070	037592	XSTR SINPN2N4275 SEL VCE0=20V	Q1,6	2	52542	
0071	101378	XSTR SI PNP 2N3906 40V 100B300	Q2,4,5	3	04713	2N3906
0072	101377	XSTR SI NPN 2N3904 40V 100B300	Q3	1	04713	2N3904
0076	101367	XSTR SI PNP PN3645 60V 80B240	Q7	1	07263	PN3645-18
0077	117349	XSTR SIPNPMPS-A63 30V H>5K@10M	Q8	1	04713	MPS-A63
0089	101558	RES CC1/4W 100K 5%	R2	1	01121	CB1045
0090	101735	RES CC1/4W 56 OHMS 5%	R3,4,33,	4	0112	CB5605
			R44			
0092	101581	RES CC1/4W 1.2K 5%	R5	1	01121	CB1225
0093	102163	POT 4T PC500 20% 1/2W CERM T	R6,8,10	6	'('	TM-7W-500 OHMS
			R12,14			
			R16			
0094	117576	RES MF 4.99K .1 W 1% 100PPM	R7,9,11,	8		C=RN55D4991F
			R13,15			
			17,22,23			
0111	101536	RES CC1/4W330 OHMS 5%	R24,25	3	01121	CB3315
			R27			
0113	101625	RES CC1/4W470 OHMS 5%	R26,35	3	01121	CB4715
			R36			
0115	117588	RES MF 33.2 .1 W 1% 100PPM	R28	1		C=RN55D33R2F
0116	620268	RES MF 953 .13W 1% 100PPM	R29	1		C=RN60D9530F
0117	103195	RES MF 200 1% .12W@125C 100	R30	1	19701	MF5C-D-2000F
0118	117594	RES MF 681 .1 W 1% 100PPM <	R31	1		C=RN55D6810F
0119	101485	RES CC1/2W270 OHMS 5%	R32	1	01121	EB2715
0124	101567	RES CC1/4W 820 OHM 5%	R37	1	01121	CB8215
0125	101566	RES CC1/4W 220 OHM 5%	R38	1	01121	CB2215
0126	101542	RES CC1/4W270 OHMS 5%	R39	1	01121	CB2715
0127	103194	RES MF 806 1% .12W@125C 100	R40	1	91637	CMF-60 T1
0128	119155	RES MF 1.87K .1W 1% 25PPM/C	R41	1	91637	CMF-55 T9
0129	117589	RES MF 100 .1 W 1% 100PPM <	R34,42	2		C=RN55D1000F
0130	102133	RES MF 63.4 .12W 1% 100P	R43	1	91637	CMF-60 T1

TITLE A23, Pulse Modulator Driver PC Board Assembly 08330102 (Option S6002) (Figure 5-36) — Continued

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0132	101508	RES CC1/2W120 OHMS 5%	R45	1	0112	EB1215
0133	101509	RES CC1/2W 27 OHMS 5%	R46,49	2	01121	EB2705
0134	118859	RES MF 2940HMS.1W 1% 50PPM <.1	R47	1	16299	NC55 294 1%
0135	117818	RES MF 4990HMS.1 W 1% 100 PPM	R48,51	2		C=RN55D4990F
0137	103018	RES MF 255 .12W 1% 25PP	R50	1	91637	MFF 1/8 T9
0140	101598	RES CC 1/4W 4.7K 5%	R54	1	01121	CB4725
0142	101552	RES CC1/4W 15K 5%	R55	1	01121	CB1535
0156	103749	IC TTL SS174LS04 HEX INV <20NS	U1	1	01295	SN74LS04N
0157	103217	IC CMOS 4049 HEX INV BUFF LT	U2	1	02735	MC14049BCP
0158	103937	IC CMOS SS4011 4 2IN NAND 14DI	U3	1	04713	MC14011BCP
0159	103938	IC CMOS SS4012 2 4IN NAND 14DI	U4	1	04713	MC14012BCP
0160	103976	IC TTL SS174LS123 DUAL RETRIG	U5-7,11	4	01295	SN74LS123N
0164	118879	IC TTL SS174LS126A 4#3ST BUF H	U9,10	2	01295	SN74LS126AN
0168	117056	IC TTL MS174LS279 4 ^S/^R LATC	U12	1	01295	SN74LS279N
0169	117014	IC VOLTREG 79L05 -4.8V/-5.2V	U13	1	04713	MC79L05ACP
0170	117101	IC VOLTREG78L05 5V 5% <.4W@75C	U14	1	04713	MC78L05ACP
0171	057913	RES MODULE4-100K 20% >.1W .53H	U15,16	2	52542	MRG-C-5Y-100K-K
0175	100532	SPCR SWAGE 6-32 .50L I.25RND		1	88245	1530 B 1/2

SINGLE LEVEL EXPLOSION

TITLE A24, Timebase Divider PC Board Assembly 08317701 (Figure 5-38)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0002	708317701	SCH PCB DIVIDER	REF		52542	
0005	2083177	A/W PCB DIVIDER	REF		52542	
0007	083177	FAB PCB DIVIDER		1	52542	
0009	100176	CAP CER DP 1UF 50V 20% Z5U .38	C1,2	2	56289	2C37Z5U105M050B
0011	103714	CAP TANT 100UF 10V 10% RDL .2	C3	1	56289	196D107X9010PE4
0012	10010301	CAP C DISC.01UF 100V 80/-20% I	C4	1	72982	DD560B10ZU103Z100V
0013	117621	CAP CER DP 10PF 100V 5% COG	C5	1	96733	DB44BY100J
0014	100413	DIODE RECT1N5395 400V 1.5A.26L	CR1	1	04713	1N5395
0015	101711	RES CC1/8W1.0K 5%	R1	1	01121	BB1025
0017	101672	RES CC1/4W 51 OHMS 5%	R3	1	01121	CB5105
0018	045256	IC VOLTREGMC7805 5V 1.5A 6W/C	U1	1	04713	MC7805CT
0019	103164	IC TTL MSI74LS196 PRST BCD CNT	U2,3	2	01295	SN74LS196N
0020	117508	IC TTL MSI74LS244 8BFR 2ENBL L	U4	1	01295	SN74LS244N
0022	102879	JUMPER, 22AWG INSULATED .09D	W1	1	55210	L-2007-1
0024	100482	TERM SWAGEBIFUR .062MAT.16HI.0		19	88245	2000B-1
0025	100539	SPCR SWAGE6 .06MAT 1/4L X 1/4R		2	71279	1247-11
0026	118873	HEATSINK, TO220, #5771B	XU1	1	30161	5771B
0035	100750	THERMAL COMPOUND FOR XSTR MTG.		1	05820	120-8
0037	10062605	PHMS CRES 4-40 x 5/16		1	96906	MS51957-14
0038	100711	WSHR LOCK SPLIT #4		1	96906	MS35338-135
0039	100622	NUT HEX 4-40 .19AF .06THK SS		1	80205	NAS671C4

SINGLE LEVEL EXPLOSION

TITLE A31, 2—8 GHz Output Bracket 08320101 (Figure 5-40)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0002	083201	FAB 2-8GHZ BRACKET		1	52542	
0004	123503	OSC YIG TN2-8GHZ W/SHIELD	Y1	1	59787	MSO-0208-268-01
0005	117721	FLTR YIG T2-12GHZ 2STAGE 25MHZ	Y2	1	29111	SDYF 4000-114
0006	123710	FXD ATTEN 7DB DC/18GHZ SMA PIN		1	34075	444M-7DB
0007	103222	FXD ATTENR10DB DC/18GHZ SMA MA		1	34078	444-10
0008	08325001	ASSY 2-8 GHZ AMPLIFIER	A1,4	2	52542	
0009	07724801	ASSY 2-12GHZ LEVELER	A2	1	52542	
0010	07724702	ASSY 2-8GHZ MODULATOR	A3	1	52542	
0012	077071	COAX RELAY SPECIFICATIONS	K1,2	2	52542	909C70100
0014	5083280	W/L A31 CABLE	P1	1	52542	
0016	103305	ADAPTER RFSMA RTANG PLUG/PLUG		1	16733	705976-001
0021	08329021	ASSY SEMI RIGID CABLE	W1	1	52542	
0022	08329022	ASSY SEMI RIGID CABLE	W2	1	52542	
0023	08329023	ASSY SEMI RIGID CABLE	W3	1	52542	
0025	10062604	PHMS CRES 4-40 X 1/4		8	96906	MS51957-13
0026	10062620	PHMS CRES 4-40 X 1 1/4		2	96906	MS51957-22
0027	10063205	PHMS CRES 6-32 X 5/16		8	96906	MS51957-27
0030	100711	WSHR LOCK SPLIT #4		8	96906	MS35338-135
0031	100712	WSHR LOCK SPLIT #6		8	96906	MS35338-136
0034	100703	WSHR FLAT #4 .125 ID.250 OD CR		12	96906	MS15795-803
0035	100704	FLAT WSHR 6 .156 ID.312 OD CR		8	96906	MS15795-805
0038	100941	NUT KEP 4-40 .2810D .11THK C		2	78189	511-041800-00

SINGLE LEVEL EXPLOSION

TITLE A32, 8—18 GHz Output Bracket 08320201 (Figure 5-41)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0002	083202	FAB 8-18GHZ BRACKET		1	52542	
0004	12350501	OSC YIG 6-18 GHZ		1	24539	AV76318
0006	123530	ISOLATOR 6-18GHZ IL 1.0DB	U1	1		VF1558
0007	08323901	ASSY 8-18GHZ LEVELER&MODULATOR	A1	1	52542	
0008	08325101	ASSY 6-18GHZ AMPLIFIER	A2	1	52542	
0010	077071	COAX RELAY SPECIFICATIONS	K1-4	4	52542	909C70100
0012	123516	FILTER COAX 18GHZ LOW PASS	FL1	1	12598	L-1372
0013	123515	FILTER COAX 12GHZ LOW PASS	FL2	1	12598	L-1371
0015	5083281	W/L 8-18 GHZ BRKT W/PULSE	P1	1	52542	
0017	103305	ADAPTER RFSMA RTANG PLUG/PLUG		1	16733	705976-001
0021	08329024	ASSY SEMI RIGID CABLE	W1	1	52542	
0022	08329025	ASSY SEMI RIGID CABLE	W2	1	52542	
0023	08329026	ASSY SEMI RIGID CABLE	W3	1	52542	
0024	08329027	ASSY SEMI RIGID CABLE	W4	1	52542	
0026	10062604	PHMS CRES 4-40 x 1/4		4	96906	MS51957-13
0027	10062612	PHMS CRES 4-40X3/4		2	96906	MS51957-19
0028	10063205	PHMS CRES 6-32 x 5/16		4	96906	MS51957-27
0031	100711	WSHR LOCK SPLIT #4		4	96906	MS35338-135
0032	100712	WSHR LOCK SPLIT #6		4	96906	MS35338-136
0035	100703	WSHR FLAT #4 .125 ID.250 OD CR		20	96906	MS15795-803
0036	100704	FLAT WSHR 6 .156 ID.312 OD CR		4	96906	MS15795-805
0039	100941	NUT KEP 4-40 .281OD .11THK C		8	78189	511-041800-00
0040	10062614	PHMS CRES 4-40X7/8		6	96906	MS51957-20

SINGLE LEVEL EXPLOSION

TITLE A33, 2—8 GHz Reference Bracket 08320301 (Figure 5-42)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0002	083203	FAB REFERENCE OSCILLATOR BRKT		1	52542	
0004	123504	OSC YIG TN2-8GHZ W/INTEGRAL FI	Y1	1	59787	MSF0208-268-02
0006	117748	DIR CDUPLR2-8GHZ 10DB DIR>20DB	A1	1	99899	2045-10
0007	055185	ASSY POWER DIVIDER	A2	1	52542	
0008	05716903	ASSY SAMPLER	A3	1	52542	
0009	117830	MIX DBLBAL2-26GHZ		1		DMS 1-26
0010	116630	FXD ATTENR10DB <18GHZ SMA PIN/		1	34078	444-10D8M
0011	119345	FXD ATTENR 3DB DC/18GHZ SMA		1	34078	444M-3DB
0012	05542803	FXD ATTEN 3DB DC>18GHZ SMA M&F		1	52542	055428
0013	PHANTOM 5083282	W/L A33 CABLE	P1	1	52542	
0015	100753	TIE CABLE 0-3/4 NAT NYLON 4IN		3	96906	MS3367-4-9
0017	117319	ADAPTER RFSMA PLUG/SMA PLUG		1		PE9069
0021	08329028	ASSY SEMI RIGID CABLE	W1	1	52542	
0025	10062506	PHMS CRES 2-5 X 3/8		4	96906	MS51957-5
0026	10062604	PHMS CRES 4-40 x 1/4		2	96906	MS51957-13
0027	100835	PHMS CRES 4-40X9/16 PHILLIPS		2	08547	M51957-120
0028	10063205	PHMS CRES 6-32 x 5/16		4	96906	MS51957-27
0030	100941	NUT KEP 4-40 .2810D .11THK C		2	78189	511-041800-00
0032	100614	WSHR FLAT #2 .093 ID.250 OD CR		4	96906	MS15795-802
0033	100703	WSHR FLAT #4 .125 ID.250 OD CR		4	96906	MS15795-803
0034	100704	FLAT WSHR 6 .156 ID.312 OD CR		4	96906	MS15795-805
0036	100661	WSHR LOCK SPLT #2		4	96906	MS35337-77
0037	100711	WSHR LOCK SPLIT #4		2	96906	MS35338-135
0038	100712	WSHR LOCK SPLIT #6		4	96906	MS35338-136
0040	102969	PLUG TERMNSMA 50 OHM		1	16179	20020P

SINGLE LEVEL EXPLOSION

TITLE A34, Downconverter Bracket 08369801 (Option 01) (Figure 5-43)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0002	083698	FAB DOWNCONVERTER BRACKET		1	52542	
0004	117748	DIR COUPLR2-8GHZ 10DB DIR>20DB	A1	1	99899	2045-10
0005	05716903	ASSY SAMPLER	A2	1	52542	
0006	123536	MIXER 6-8GHZ IF	U1	1	63132	DXM 564
0007	083561	AMPLIFIER 10MHZ-2GHZ +18DBM	U2	1		
0008	11771501	COUPLR DIR10DB .01-1GHZ DIR>10	U3	1	52542	
0009	117746	DETECTOR .01-18GHZ -.4MV/UW S	U4	1	99899	D103
0012	05542803	FXD ATTEN 3DB DC>18GHZ SMA M&F		1	52542	055428
0013	116630	FXD ATTENR10DB <18GHZ SMA PIN/		1	34078	444-10DBM
0015	117770	FILTER LP 2GHZ@1DB 40DB@2.5 SM	FL1,2	2		LM13-2000AA
0024	102747	TIE ANCHORFOR MIN CABLE TIES #		1	06383	TMIS4C
0025	100753	TIE CABLE 0-3/4 NAT NYLON 4IN		3	96906	MS3367-4-9
0029	08329031	ASSY SEMI RIGID CABLE	W1	1	52542	
0030	08329030	ASSY SEMI RIGID CABLE	W2	1	52542	
0035	102969	PLUG TERMNSMA 50 OHM		1	16179	20020P
0037	103305	ADAPTER RFSMA RTANG PLUG/PLUG		1	16733	705976-001
0039	117319	ADAPTER RFSMA PLUG/SMA PLUG		3		PE9069
0040	10062616	PHMS CRES 4-40X1		2	96906	MS51957-21
0041	10062612	PHMS CRES 4-40X3/4		4	96906	MS51957-19
0042	10062605	PHMS CRES 4-40 * 5/16		1	96906	MS51957-14
0043	10062510	PHMS CRES 2-56 X 5-8		2	96906	MS51957-8
0044	10062505	SCREW 2-56*5/16 PHM CRES		2	96906	MS51957-4
0045	100941	NUT KEP 4-40 .281OD .11THK C		5	78189	511-041800-00
0046	100636	NUT, HEX 2-56 .19AF .06THK SS		2	96906	MS35649-224
0047	100711	WSHR LOCK SPLIT #4		2	96906	MS35338-135
0048	100661	WSHR LOCK SPLT #2		4	96906	MS35337-77
0049	100703	WSHR FLAT #4 .125 ID.250 OD CR		5	96906	MS15795-803
0050	100614	WSHR FLAT #2 .093 ID.250 OD CR		4	96906	MS15795-802
0055	123781	CONN PLUG 1 PIN .062	P1	1	27264	03-06-2011
0056	10282202	CONN TERM MALE 18-24GA BR		1	27264	02-06-2103
0057	100686	FERRITE BEAD .1380D .047ID .11		2	02114	56-590-65/3B
0058	PHANTOM 5083283	W/L A34 CABLE	REF		52542	

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TITLE A35, Front Output Bracket 08320602 (Standard) (Figure 5-44)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0002	083690	FAB FRONT OUTPUT BRACKET		1	52542	
0004	075801	DIR DETCTR1-18GHZ SMASKT RF SM	U1	1		1821S
0006	123753	PRGM ATTN 110DB/STP 18GHZ 2.2D	U2	1	50436	HP
0008	08365001	ASSY PCB VIDEO AMP		1	52542	
0010	083691	FAB ATTEN MTG PLATE		1	52542	
0011	083669	FAB DIR DET BRACKET		1	52542	
0012	067660	FAB CAN MOD VIDEO AMP		1	52542	
0014	103305	ADAPTER RFSMA RTANG PLUG/PLUG		1	16733	705976-001
0016	08369201	ASSY CABLE COAX		1	52542	
0018	08369301	ASSY CABLE SEMIRIGID	W1	1	52542	
0022	10062605	PHMS CRES 4-40 x 5/16		6	96906	MS51957-14
0024	10062606	PHMS CRES 4-40 x 3/8		6	96906	MS51957-15
0026	10063208	PHMS CRES 6-32 x 1/2		4	96906	MS51957-30
0028	100711	WSHR LOCK SPLIT #4		12	96906	MS35338-135
0030	100712	WSHR LOCK SPLIT #6		4	96906	MS35338-136
0032	100703	WSHR FLAT #4 .125 ID.250 OD CR		12	96906	MS15795-803
0033	08329033	ASSY SEMI RIGID CABLE	A32-A35	1	52542	
0034	10062603	PHMS CRES 4-40 x 3/16		2	96906	MS51957-12

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TITLE A35, Rear Output Bracket 08320603 (Option 05) (Figure 5-45)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0002	083683	FAB REAR OUTPUT BKT		1	52542	
0003	083684	FAB REAR ATTN ISOLATING PLATE		1	52542	
0005	075801	DIR DETCTR1-18GHZ SMASKT RF SM	U1	1		1821S
0006	123753	PRGM ATTN 110DB/STP 18GHZ 2.2D	U2	1	50436	HP
0008	08365001	ASSY PCB VIDEO AMP		1	52542	
0009	067660	FAB CAN MOD VIDEO AMP	A1	1	52542	
0014	103305	ADAPTER RFSMA RTANG PLUG/PLUG		2	16733	705976-001
0015	08329034	ASSY SEMI RIGID CABLE	A32-35	1	52542	
0016	10062603	PHMS CRES 4-40 x 3/16		2	96906	MS51957-12
0017	083669	FAB DIR DET BRACKET		1	52542	
0018	10062605	PHMS CRES 4-40 x 5/16		8	96906	MS51957-14
0019	10062606	PHMS CRES 4-40 x 3/8		2	96906	MS51957-15
0020	10063208	PHMS CRES 6-32 x 1/2		4	96906	MS51957-30
0021	100712	WSHR LOCK SPLIT #6		4	96906	MS35338-136
0022	100711	WSHR LOCK SPLIT #4		12	96906	MS35338-135
0023	100703	WSHR FLAT #4 .125 ID.250 OD CR		10	96906	MS15795-803
0024	508320603	W/L COAX CABLE	W1	1	52542	

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TITLE A35A1, Video Amplifier PC Board Assembly 08365001 (Figure 5-46)

ITEM	SD STOCK NUMBER	COMPONENT DESCRIPTION	REF	T/Q	MFR'S CODE	MANUFACTURER'S PART NUMBER
0001	708365001	SCH PCB VIDEO AMPLIFIER	REF		52542	
0002	2083650	ARTWORK PCB VIDEO AMPLIFIER	REF		52542	
0003	083650	FAB PCB VIDEO AMPLIFIER		1	52542	
0004	117639	CAP CER DP 1000PF 100V 5% C0G	C1-3,6,7	5	96733	DB45BY102J ··
0007	103716	CAP TANT 1UF 35V 10%	C4,5,8	3	56289	196D105X9035HA1
0008	117358	CAP CER DP4.7PF 100V C0G (.15W	C9,10	2	71590	CN10A4R7D
0010	100155	CAP C MOLD .1 UF 50V 10%	C11-14	4	32159	6505BX104K
0012	103496	CAP TANT 22UF 10V 10% .260".4	C15,16	2	56289	196D226X9010JA1
0014	100413	DIODE RECTIN5395 400V 1.5A.26L	CR2,3	2	04713	1N5395
0015	100385	DIODE SIG 1N4151 50V	CR1	1	03508	1N4151
0016	11981801	RELAY 12V R850 DPDT 1A@28V TO-	K1	1		732-12
0017	101396	XSTR SI NPN MPS-A12 DARLINGTON	Q1	1	04713	MPS-A12
0018	106250	RES MF 499 .12W 1% 100PPM	R1,5,6, 10,11,16	6	16299	NA60
0020	106311	RES MF 10.7K .12W 1% 100PPM	R3	1		RN60D1072F
0021	106323	RES MF 4.53K .12W 1% 100PPM	R4	1		RN60D4531F
0022	101709	RES CC1/8W470 OHMS 5%	R14,15, 22,23	4	0112	BB4715
0023	118841	POT 20T PC20K .5W 10% ENDADJ	R9,R24	2	73138	66XR20K
0025	119017	RES MF 6.04K .1W 1% 2	R8,13	2	91637	CMF-55 T9
0031	101609	RES CC 1/4W 100 OHM 5%	R2,17	2	01121	CB1015
0035	123764	RES CC 1/2W 75 OHMS 5%	R18,19	2	01121	EB7505
0037	101557	RES CC 1/4W 10 OHMS 5%	R7,12,20 21	4	01121	CB1005
0043	117101	IC VOLTREG78L05 5V 5% (.4W@75C	U1	1	04713	MC78L05ACP
0044	117014	IC VOLTREG 79L05 -4.8V/-5.2V	U2	1	04713	MC79L05ACP
0045	123754	VIDEO AMPLIFIER	U3,4	2		CA3450
0049	103173	RECEPT RF RTANG JACK SMB PCMT	J1,2,3	3	98291	51-053-0000
0053	102879	JUMPER, 22AWG INSULATED .09D	W1	1	55210	L-2007-1
0054	100482	TERM SWAGEBIFUR .062MAT.16HI.0		4	88245	2000B-1
0056	100517	SPCR SWAGE6 .06MAT 1/8L X 1/4R		4	71279	1247-9
0057	PHANTOM 508365001	W/L VIDEO AMP		1	52542	

SINGLE LEVEL EXPLOSION

CHAPTER 5

DRAWINGS

5-1. INTRODUCTION

5-1.1 This chapter contains the printed circuit board assembly and schematic diagrams for the 1700 Series Microwave Synthesizer. The parts list contained in Chapter 4 relates to the reference designation callouts on the diagrams.

Table 5-1. Assembly Drawings

Figure No.	Title	Drawing No.	Page No.
5-1	1700 Series Subassembly Location Drawing	083736	5-3
5-2	Power Supply A1 Heatsink	08319601	5-5
5-4	Microprocessor A2	08316601	5-9
5-6	Amplitude Control A3 (Standard/Option S6002)	08330001/ 08330002	5-15
5-8	YIG Oscillator and YIG Tuned Filter Drivers A5	08317501	5-23
5-10	Oscillator Driver A6	08317301	5-27
5-12	Frequency Control A7 (Standard/Option 03)	08317401/ 08317402	5-33
5-14	Fixed Local Oscillator Phase-Locked Loop A8	08319401	5-39
5-16	Divide-by-N A10	08318701	5-43
5-18	1 kHz Resolution Synthesizer A11 (Option 03)	08361902	5-47
5-20	100 MHz Voltage Controlled Crystal Oscillator A12	08319301	5-51
5-22	Output Phase-Locked Loop A13	08319201	5-55
5-24	Reference Phase-Locked Loop A14 (Standard)	08319101	5-59
5-26	Reference Phase-Locked Loop A14 (Option 03)	08319102	5-63
5-28	Display Interface A15	08316501	5-67
5-29	Display A15A1	08316401	5-69
5-31	Analog-to-Digital and Multiplexer A16	08317601	5-73
5-33	Sampler Driver A19/A20	08337601	5-77
5-35	Pulse Modulator Driver A23 (Standard)	08330101	5-81
5-36	Pulse Modulator Driver A23 (Option S6002)	08330102	5-83
5-38	Timebase Divider A24	08317701	5-89
5-40	2—8 GHz Output Bracket A31	08320101	5-93
5-41	8—18 GHz Output Bracket A32	08320201	5-95
5-42	2—8 GHz Reference Bracket A33	08320301	5-97
5-43	Downconverter Bracket A34 (Option 01) (Sheet 1 of 2)	08369801	5-99
5-43	Downconverter Bracket A34 (Option 01) (Sheet 2 of 2)	08369801	5-101
5-44	Front Output Bracket A35 (Standard)	08320602	5-103
5-45	Rear Output Bracket A35 (Option 05)	08320603	5-105
5-46	Video Amplifier A35A1	08365001	5-107

Table 5-2. Schematics

Figure No.	Title	Drawing No.	Page No.
5-3	Power Supply A1	708319501	5-7
5-5	Microprocessor A2 (Sheet 1 of 2)	708316601	5-11
5-5	Microprocessor A2 (Sheet 2 of 2)	708316601	5-13
5-7	Amplitude Control A3 (Standard/Option S6002) (Sheet 1 of 3)	708330001/ 708330002	5-17
5-7	Amplitude Control A3 (Standard/Option S6002) (Sheet 2 of 3)	708330001/ 708330002	5-19
5-7	Amplitude Control A3 (Standard/Option S6002) (Sheet 3 of 3)	708330001/ 708330002	5-21
5-9	YIG Oscillator and YIG Tuned Filter Drivers A5	708317501	5-25
5-11	Oscillator Driver A6 (Sheet 1 of 2)	708317301	5-29
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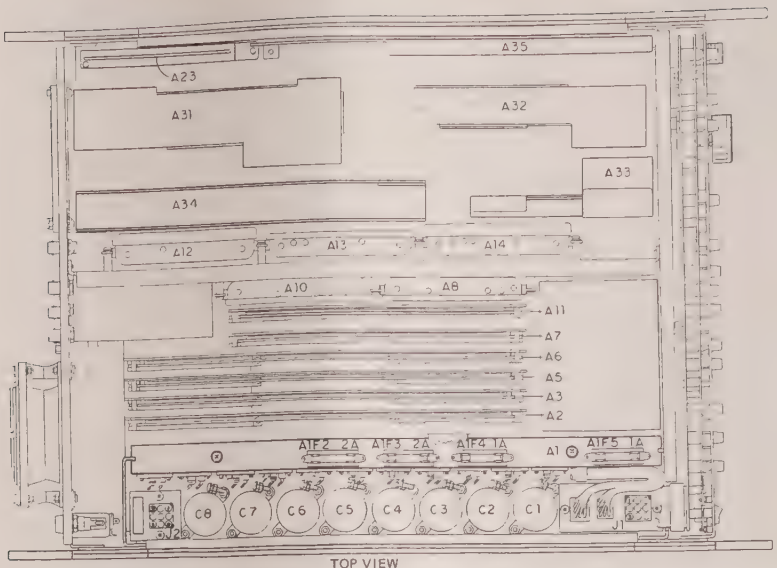
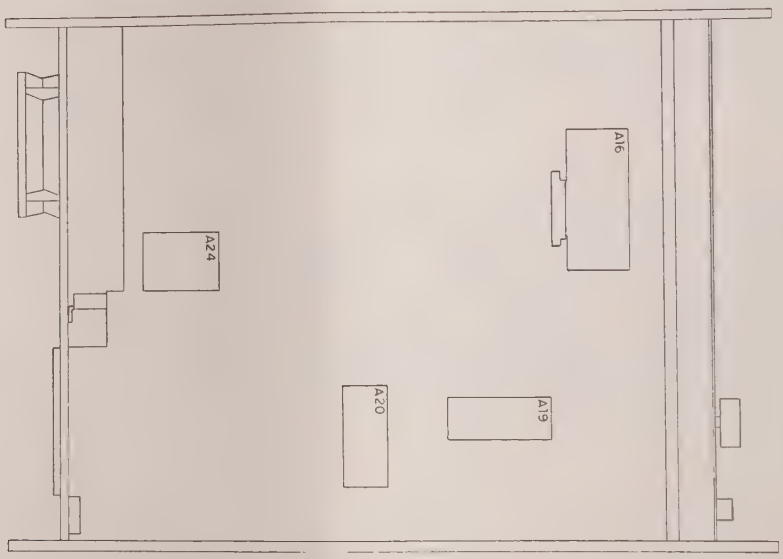
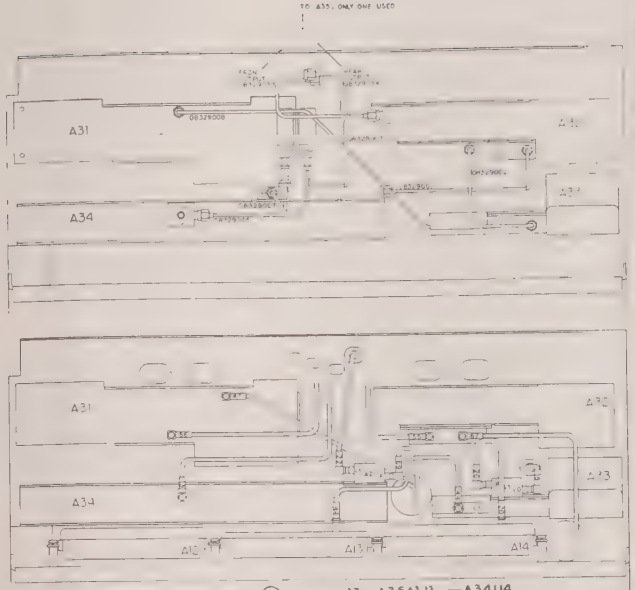
5-13	Frequency Control A7 (Standard/Option 03) (Sheet 1 of 2)	708317401/ 708317402	5-35
5-13	Frequency Control A7 (Standard/Option 03) (Sheet 2 of 2)	708317401/ 708317402	5-37
5-15	Fixed Local Oscillator Phase-Locked Loop A8	708319401	5-41
5-17	Divide-by-N A10	708318701	5-45
5-19	1 kHz Resolution Synthesizer A11 (Option 03)	708361902	5-49
5-21	100 MHz Voltage Controlled Crystal Oscillator A12	708319301	5-53
5-23	Output Phase-Locked Loop A13	708319201	5-57
5-25	Reference Phase-Locked Loop A14 (Standard)	708319101	5-61
5-27	Reference Phase-Locked Loop A14 (Option 03)	708319102	5-65
5-30	Display Interface A15 and Display A15A1	708316501	5-71
5-32	Analog-to-Digital and Multiplexer A16	708317601	5-75
5-34	Sampler Driver A19/A20	708337601	5-79
5-37	Pulse Modulator Driver A23 (Standard/Option S6002) (Sheet 1 of 2)	708330101/ 708330102	5-85
5-37	Pulse Modulator Driver A23 (Standard/Option S6002) (Sheet 2 of 2)	708330101/ 708330102	5-87
5-39	Timebase Divider A24	708317701	5-91
5-47	Video Amplifier A35A1	708365001	5-109



TOP VIEW



BOTTOM VIEW



21 A35A1J3 — C/C — A3 (10)
SHIELD — A3 (J)
47 A31A2 — C/C — A3 (W)
SHIELD — A3 (Z)
67 A32A1 — C/C — A3 (Y)
SHIELD — A3 (Z)

13 A35A1J1 — A34U4
19 A33A3LO — A19J2
20 A14J1 — A33A3IF
22 A34A2LO — A20J2
44 A13J1 — A33U1
55 A32A1PM — C/C — A23 23
SHIELD — A2324
56 A31A3PM — C/C — A2325
SHIELD — A2326
69 A34A2IF — C/C — A8B
SHIELD — A82

A1	Heatsink	08319601	
A2	CPU	08316601	
A3	Amplitude Control	08330001	STD
		-02	OPT S6002
A5	YIG Oscillator Driver	08317501	
A6	Oscillator Control	08317301	
A7	Frequency Control	08317401	STD
		-02	OPT 03
A8	Fixed LO	08319401	
A10	Divide-by-N	08319701	
A11	Reference Synthesizer (0.1 Hz)	08315302	STD
	(1 kHz)	08361902	OPT 03
A12	100 MHz VCXO	08319301	
A13	Output PLL	08319201	
A14	Reference PLL	08319101	STD
		-02	OPT 03
A15	Display Interface	08316501	
A15A1	Display	08316401	
A16	A-D Multiplexer	08317601	
A19	Sampler Driver	08337901	
A20	Sampler Driver	08337901	
A23	Pulse Modulator Driver	08330101	STD
		-02	OPT S6002
A24	Timebase Divider	08317701	
A31	2 - 8 GHz Output Bracket	08320101	
A32	8 - 18 GHz Output Bracket	08320201	
A33	2 - 8 GHz Reference Bracket	08320301	
A34	Downconverter Bracket	08369801	OPT 01
A35	Output Bracket - (Front)	08320602	STD
	- (Rear)	-03	OPT 05
A35A1	Video Amplifier	08365001	
Y1	Timebase Oscillator	123651	

Figure 5-1. 1700 Series Subassembly Location Drawing (Systron Donner No. 083736)

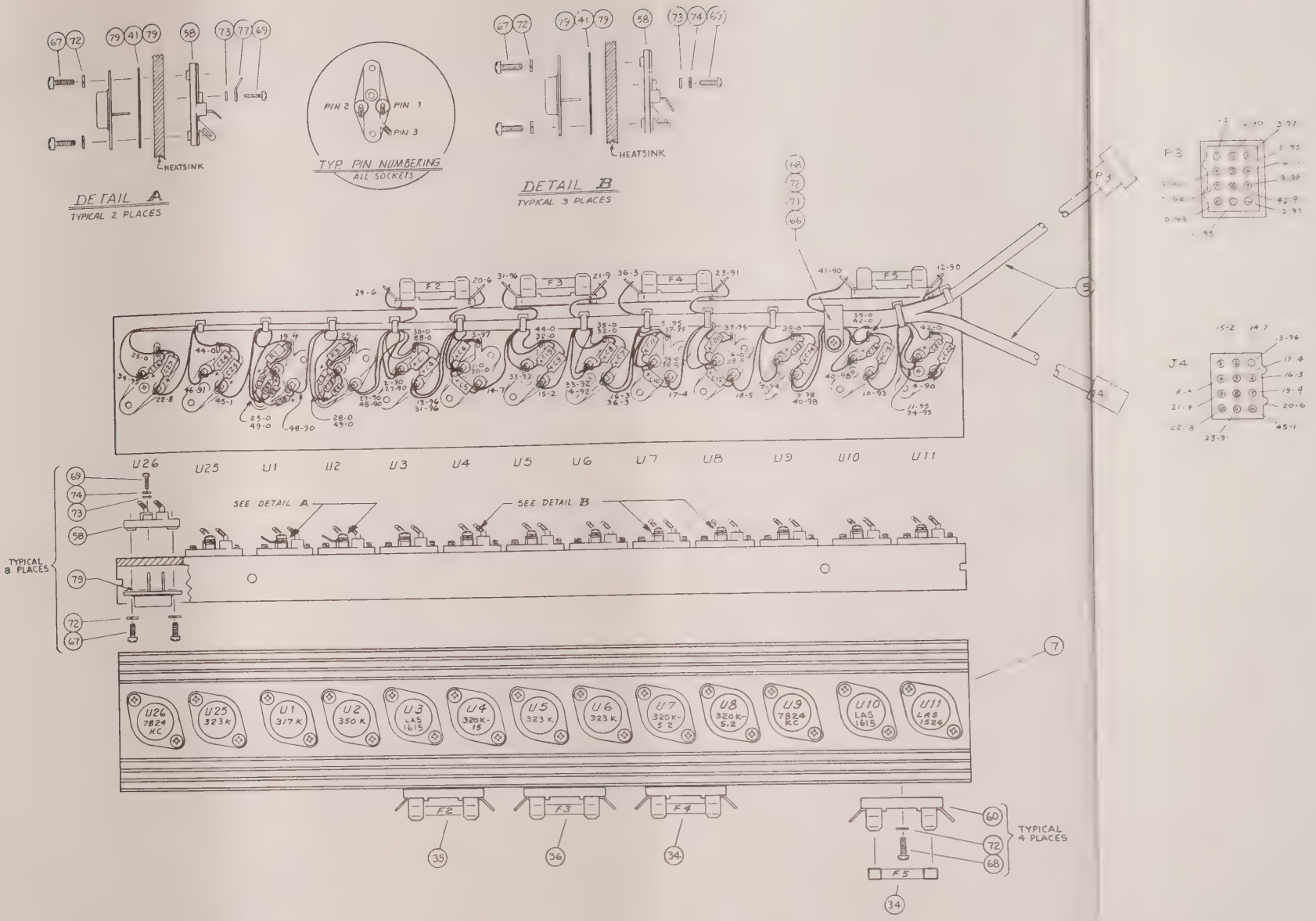


Figure 5-2. Power Supply A1 Heatsink Assembly (Systron Donner No. 08319601)

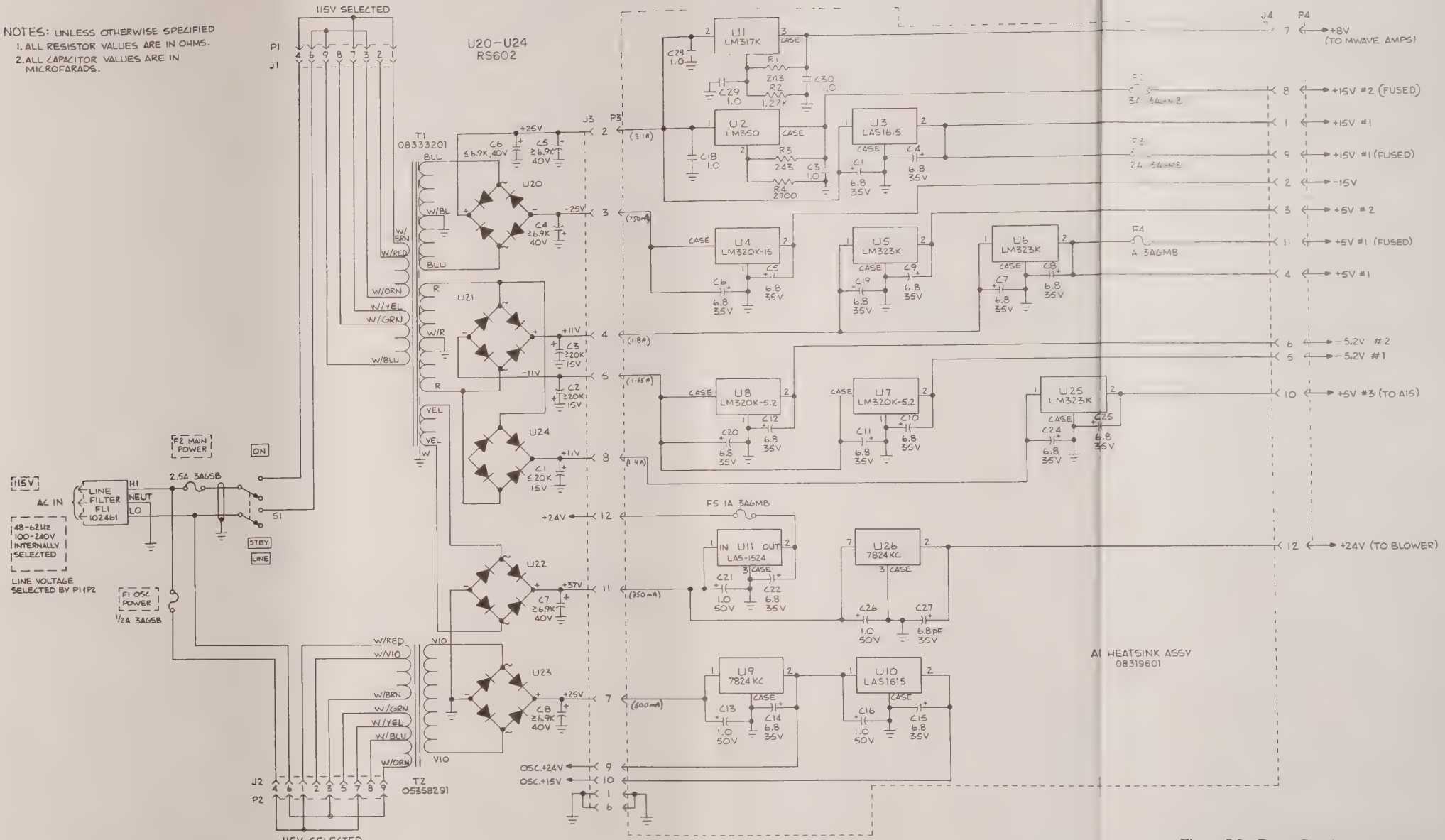


Figure 5-3. Power Supply A1 Schematic (Systron Donner No. 708319501)

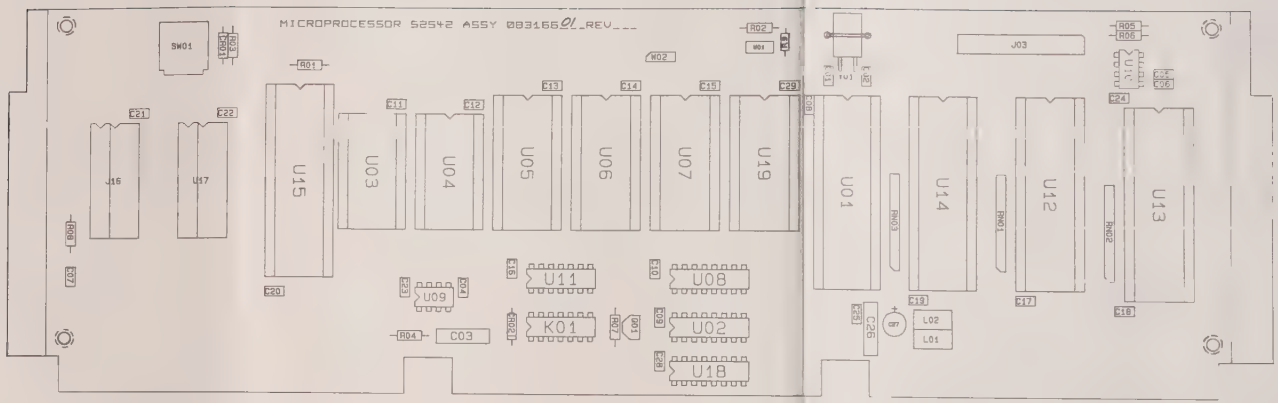


Figure 5-4. Microprocessor A2 P.C. Board Assembly (Systron Donner No. 08316601)

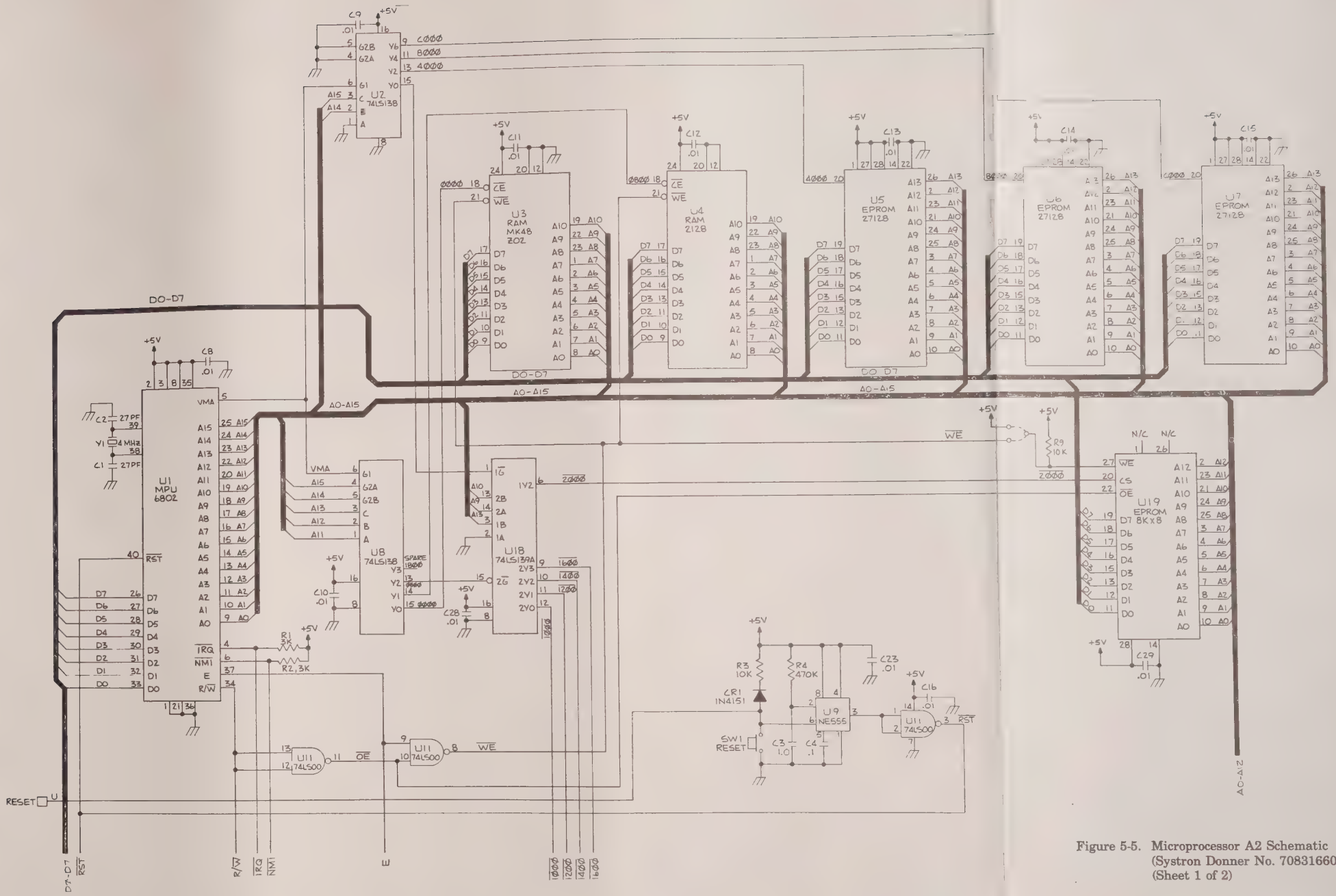


Figure 5-5. Microprocessor A2 Schematic (Systron Donner No. 708316601) (Sheet 1 of 2)

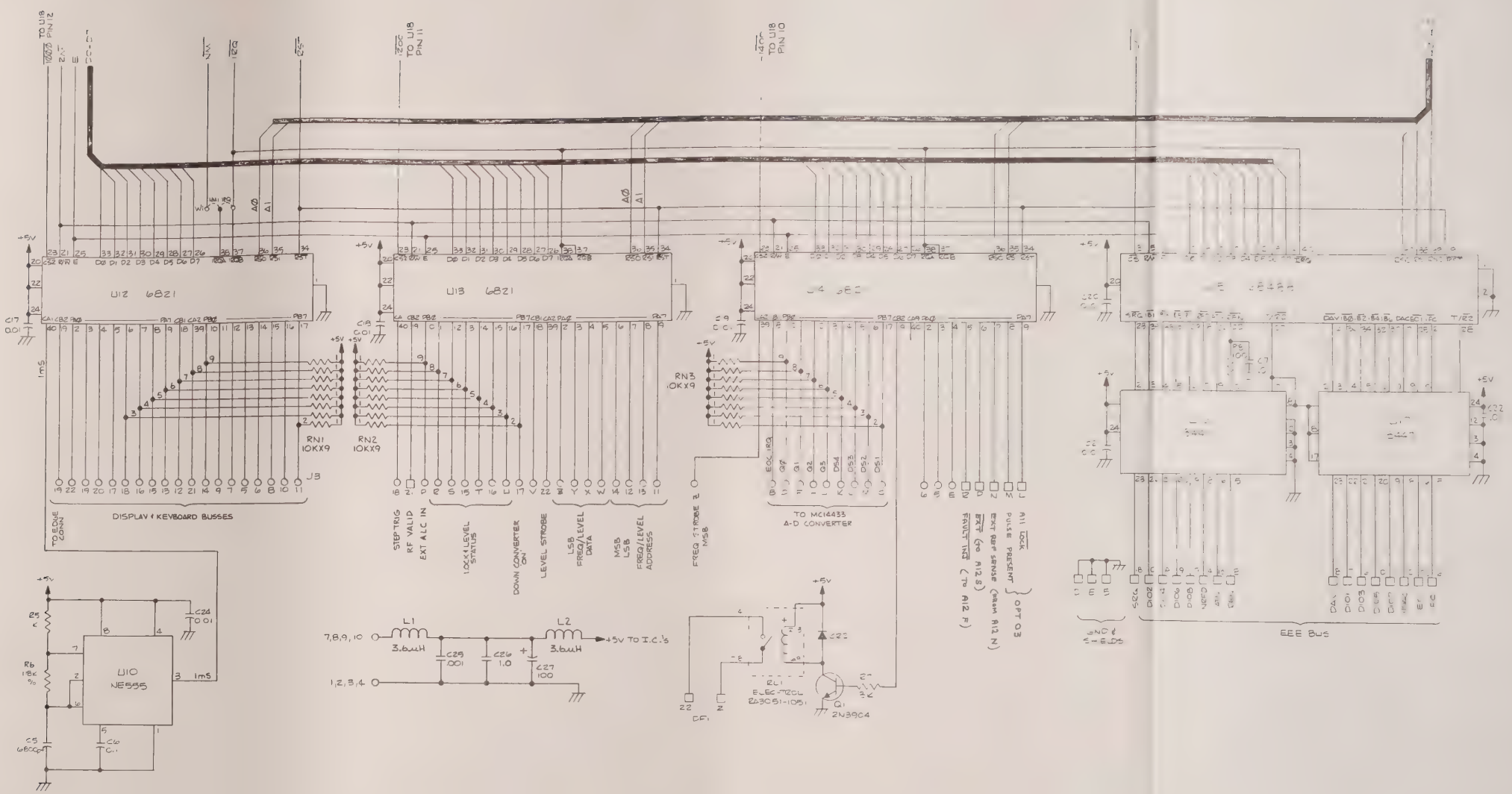
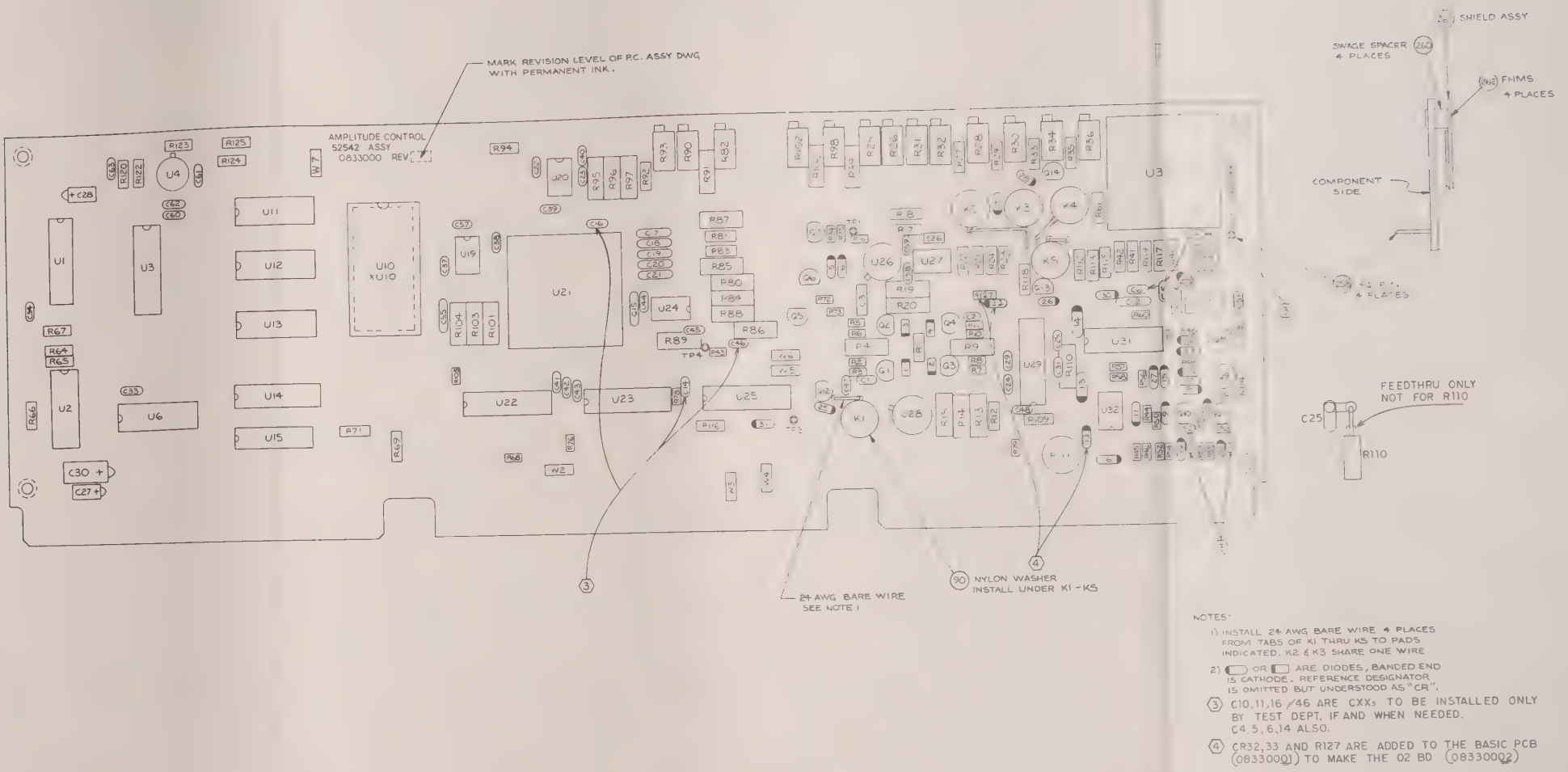


Figure 5-5. Microprocessor A2 Schematic (Systron Donner No. 708316601) (Sheet 2 of 2)



NOTES:

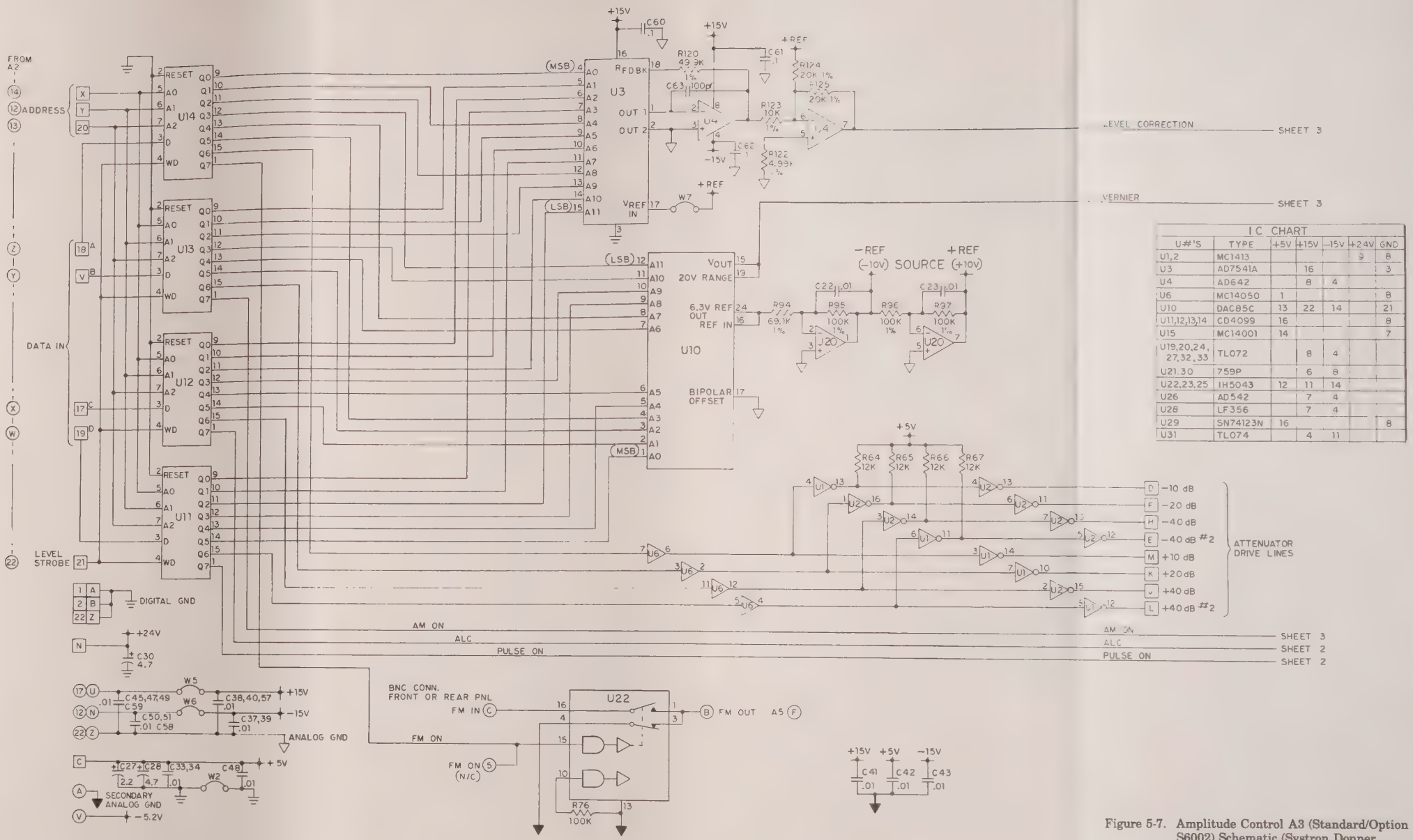
1) INSTALL 24 AWG BARE WIRE 4 PLACES FROM TABS OF K1 THRU K5 TO PADS INDICATED. K2 & K3 SHARE ONE WIRE

2) ▭ OR ▭ ARE DIODES, BANDED END IS CATHODE. REFERENCE DESIGNATOR IS OMITTED BUT UNDERSTOOD AS "CR".

(3) C10,11,16 & 46 ARE CXXs TO BE INSTALLED ONLY BY TEST DEPT. IF AND WHEN NEEDED. C4,5,6,14 ALSO.

(4) CR32,33 AND R127 ARE ADDED TO THE BASIC PCB (08330001) TO MAKE THE 02 BD (08330002)

Figure 5-6. Amplitude Control A3 (Standard/Option S6002) P.C. Board Assembly (Systron Donner No. 08330001/08330002)



IC CHART

U#'S	TYPE	+5V	+15V	-15V	+24V	GND
U1,2	MC1413				9	8
U3	AD7541A		16			3
U4	AD642		8	4		
U6	MC14050	1				8
U10	DAC85C	13	22	14		21
U11,12,13,14	CD4099	16				8
U15	MC14001	14				7
U19,20,24, 27,32,33	TL072		8	4		
U21,30	759P		6	8		
U22,23,25	IH5043	12	11	14		
U26	AD542		7	4		
U28	LF356		7	4		
U29	SN74123N	16				8
U31	TL074		4	11		

Figure 5-7. Amplitude Control A3 (Standard/Option S6002) Schematic (Systron Donner No. 708330001/708330002) (Sheet 1 of 3)

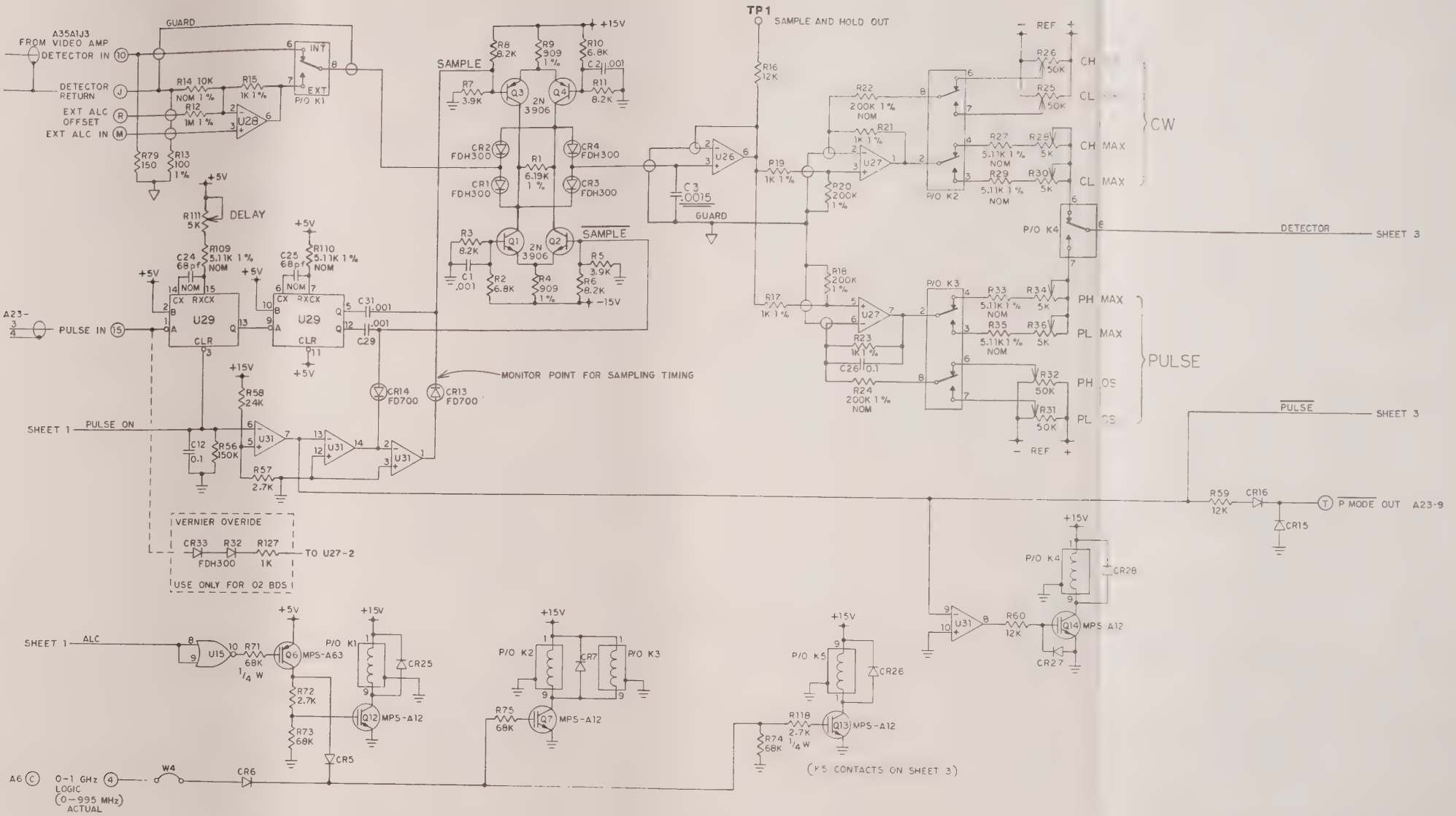


Figure 5-7. Amplitude Control A3 (Standard/Option S6002) Schematic (Systron Donner No. 708330001/708330002) (Sheet 2 of 3)

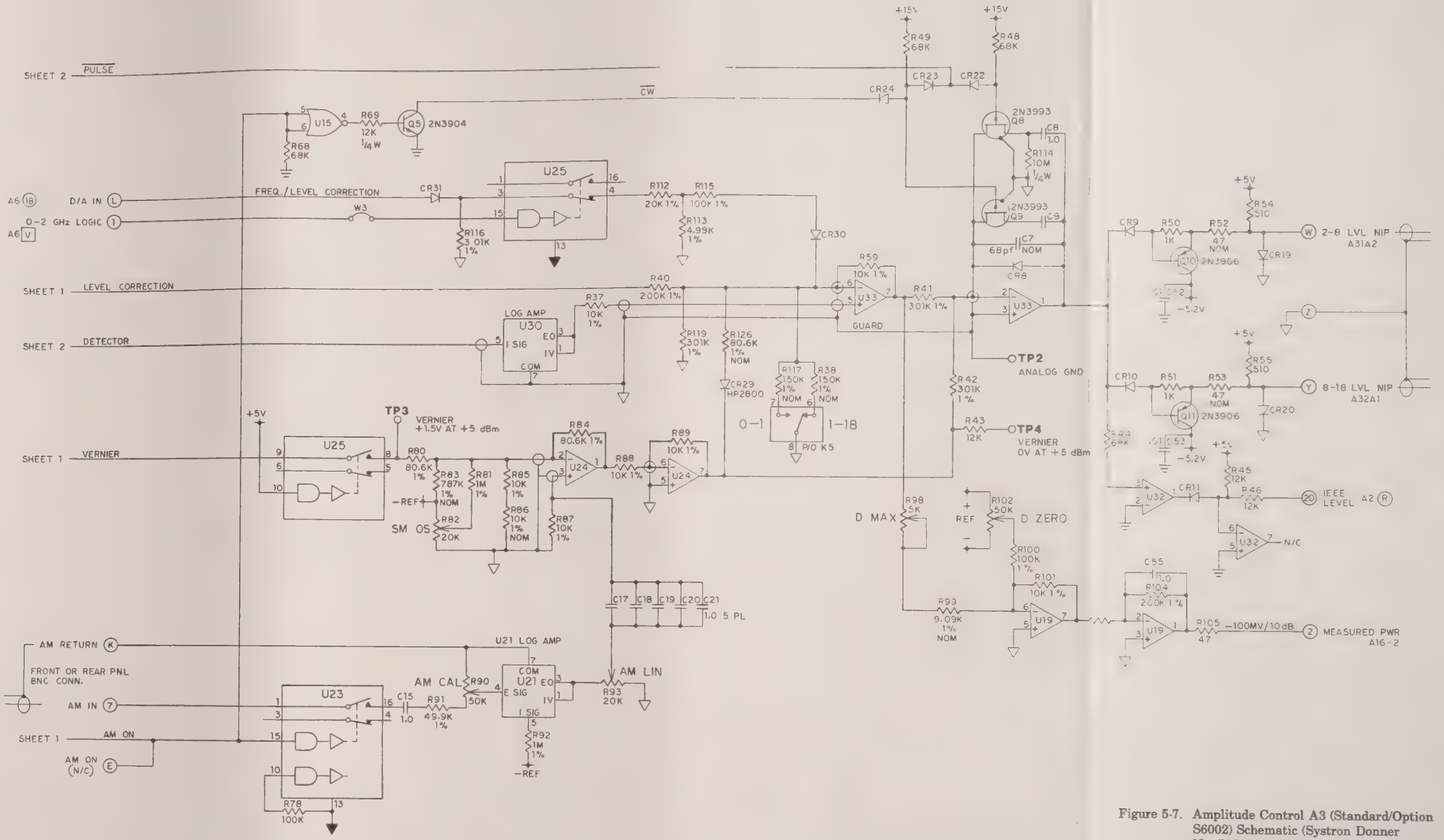


Figure 5-7. Amplitude Control A3 (Standard/Option S6002) Schematic (Systron Donner No. 708330001/708330002) (Sheet 3 of 3)

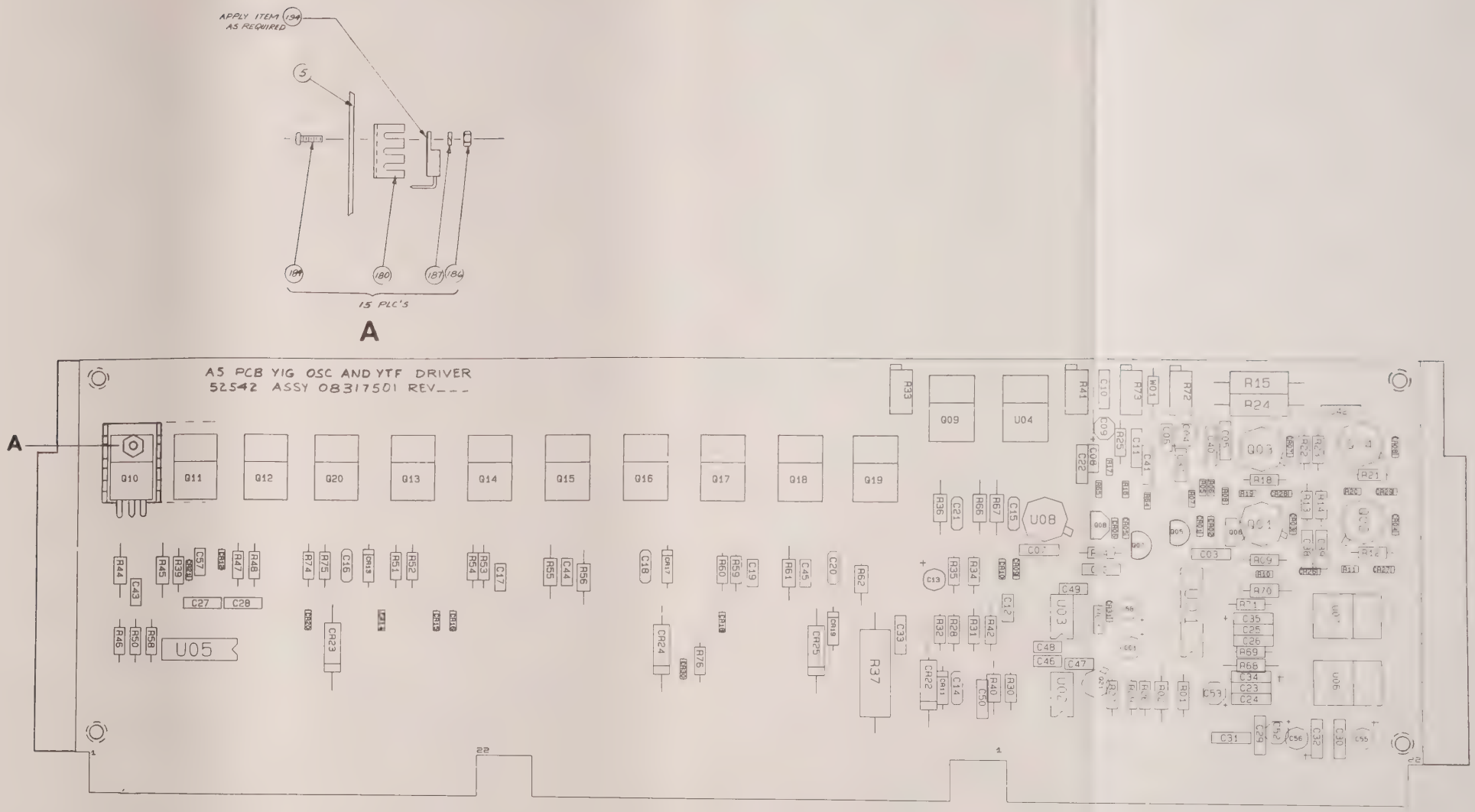


Figure 5-8. YIG Oscillator and YIG Tuned Filter Drivers A5 P.C. Board Assembly (Systron Donner No. 08317501)

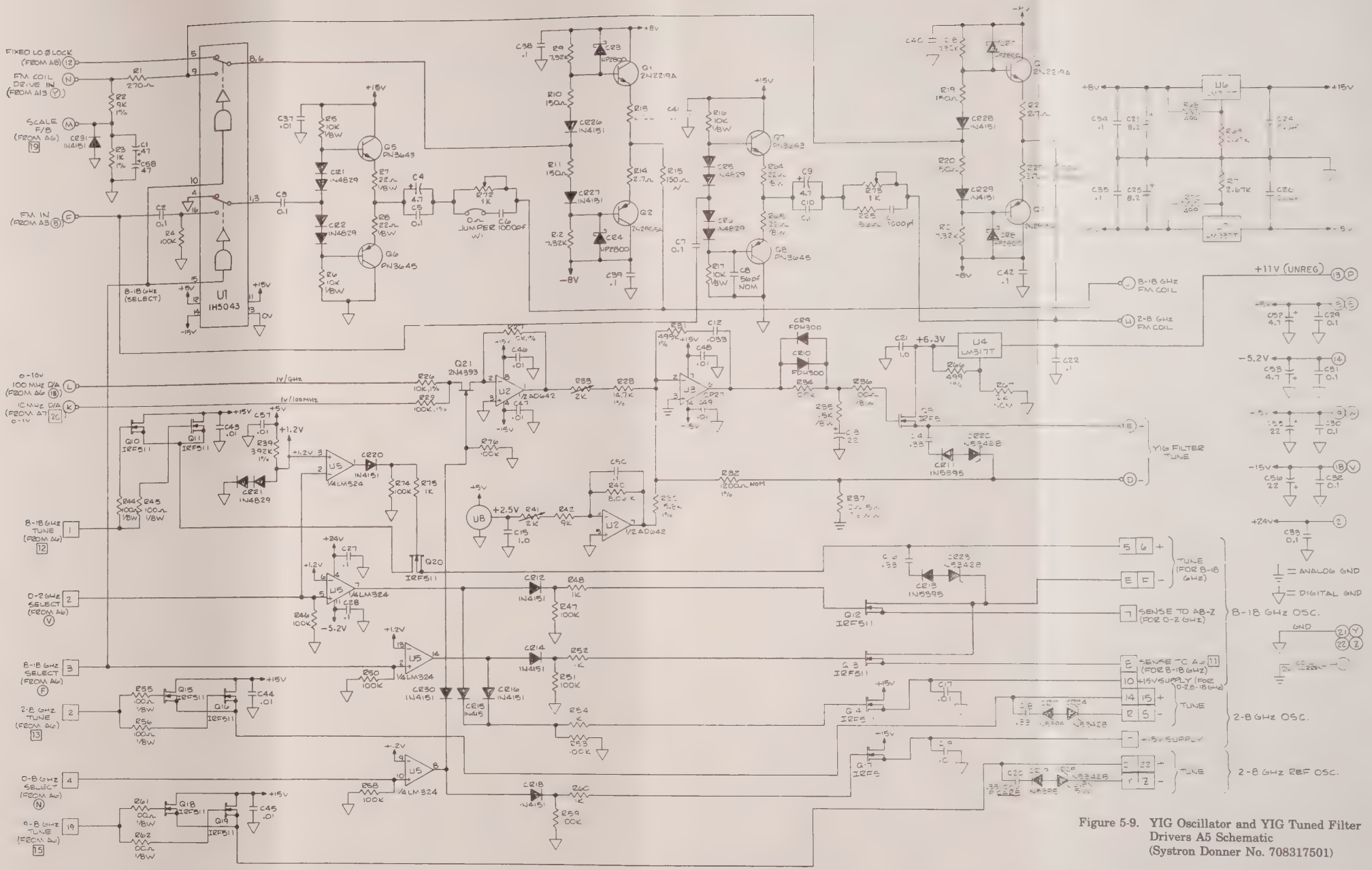


Figure 5-9. YIG Oscillator and YIG Tuned Filter Drivers A5 Schematic (Systron Donner No. 708317501)

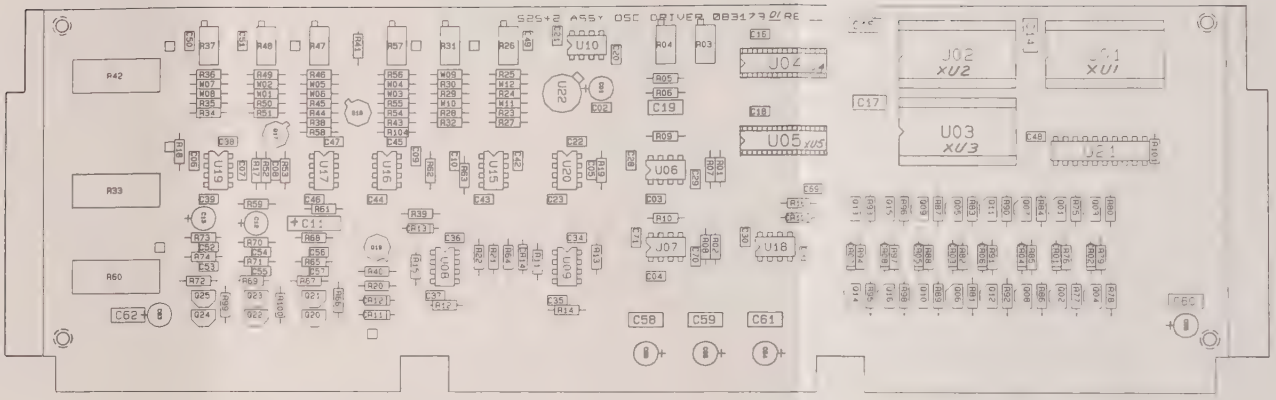


Figure 5-10. Oscillator Driver A6 P.C. Board Assembly (Systron Donner No. 08317301)

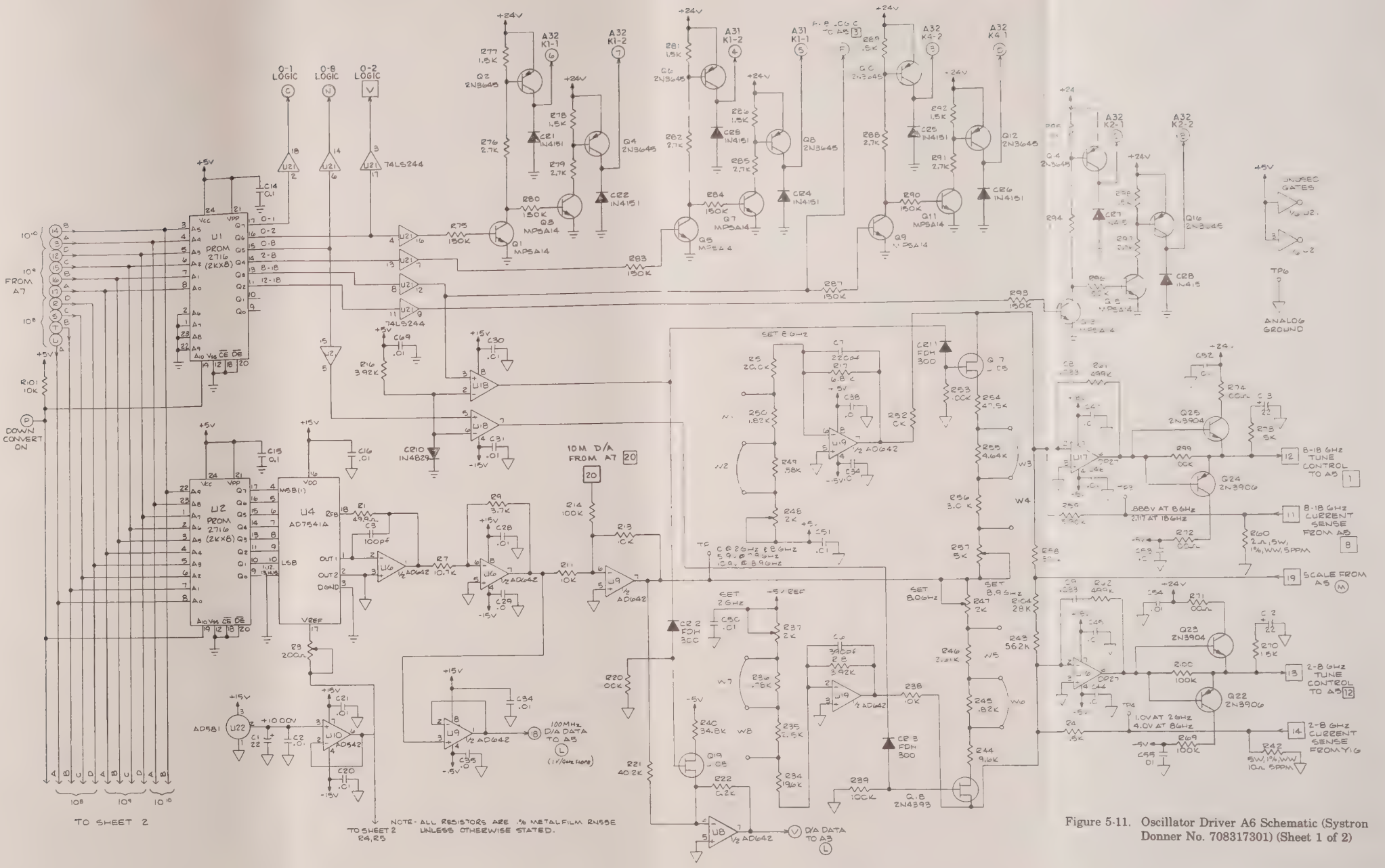
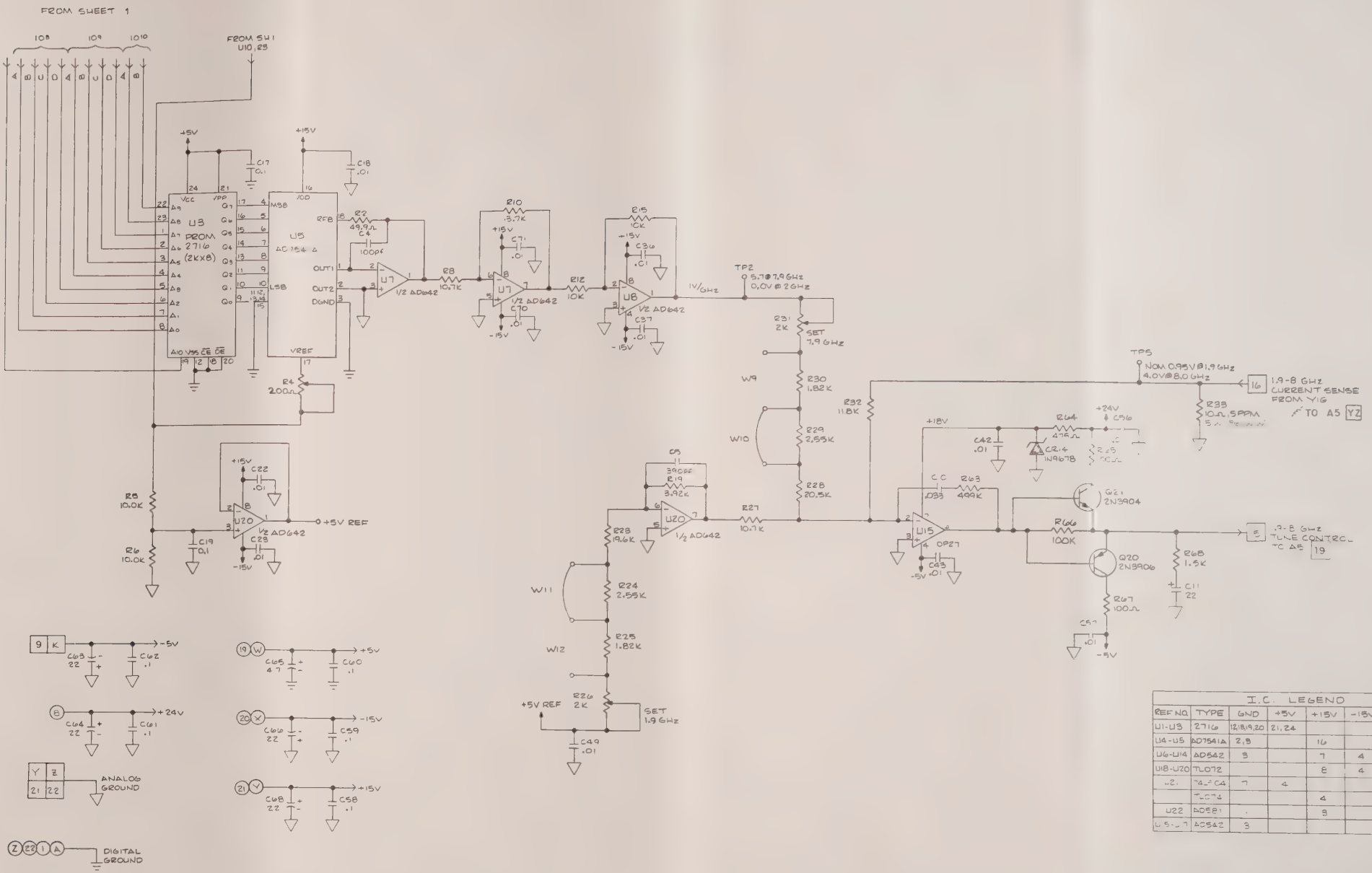


Figure 5-11. Oscillator Driver A6 Schematic (Systron Donner No. 708317301) (Sheet 1 of 2)



I.C. LEGEND							
REF NO	TYPE	GND	+5V	+15V	-15V	+18V	-5V
U1-U3	2716	12,18,19,20	21,24				
U4-U5	AD7541A	2,3		16			
U6-U14	AD542	3		7	4		
U18-U20	TL072			8	4		
U21	[illegible]	7	4				
	TL074			4			
U22	AD581			3			
U5-U7	AD542	3					

Figure 5-11. Oscillator Driver A6 Schematic (Systron Donner No. 708317301) (Sheet 2 of 2)

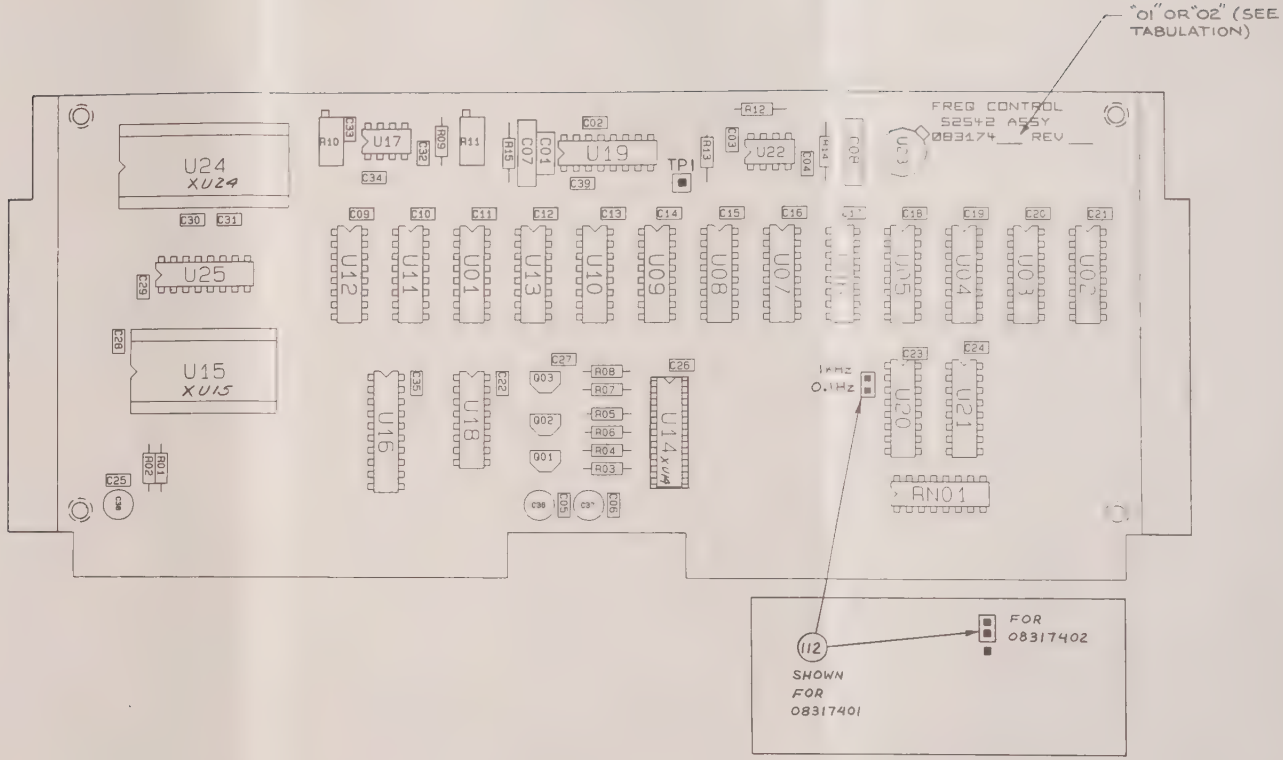


Figure 5-12. Frequency Control A7 (Standard/Option 03) P.C. Board Assembly (Systron Donner No. 08317401/08317402)

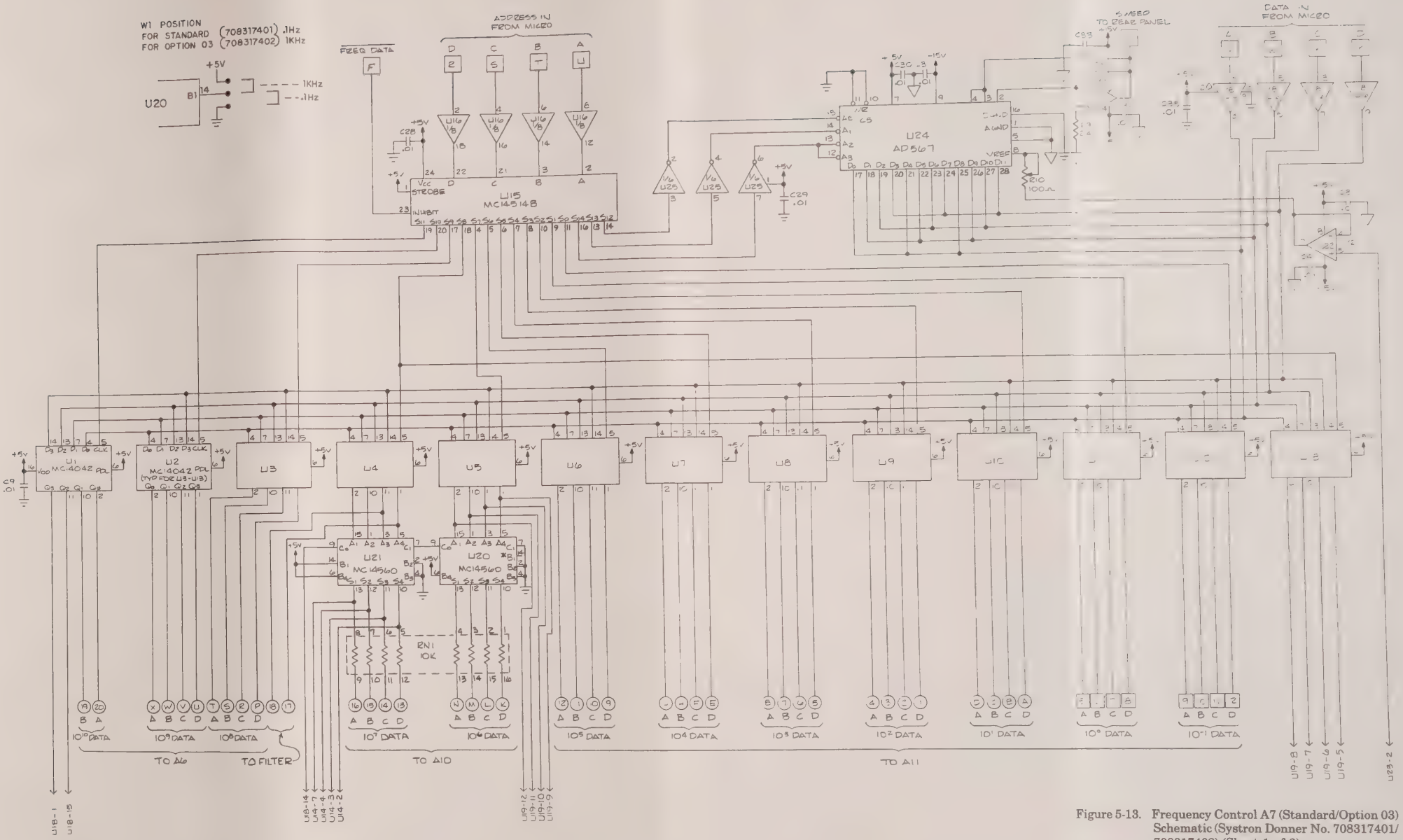
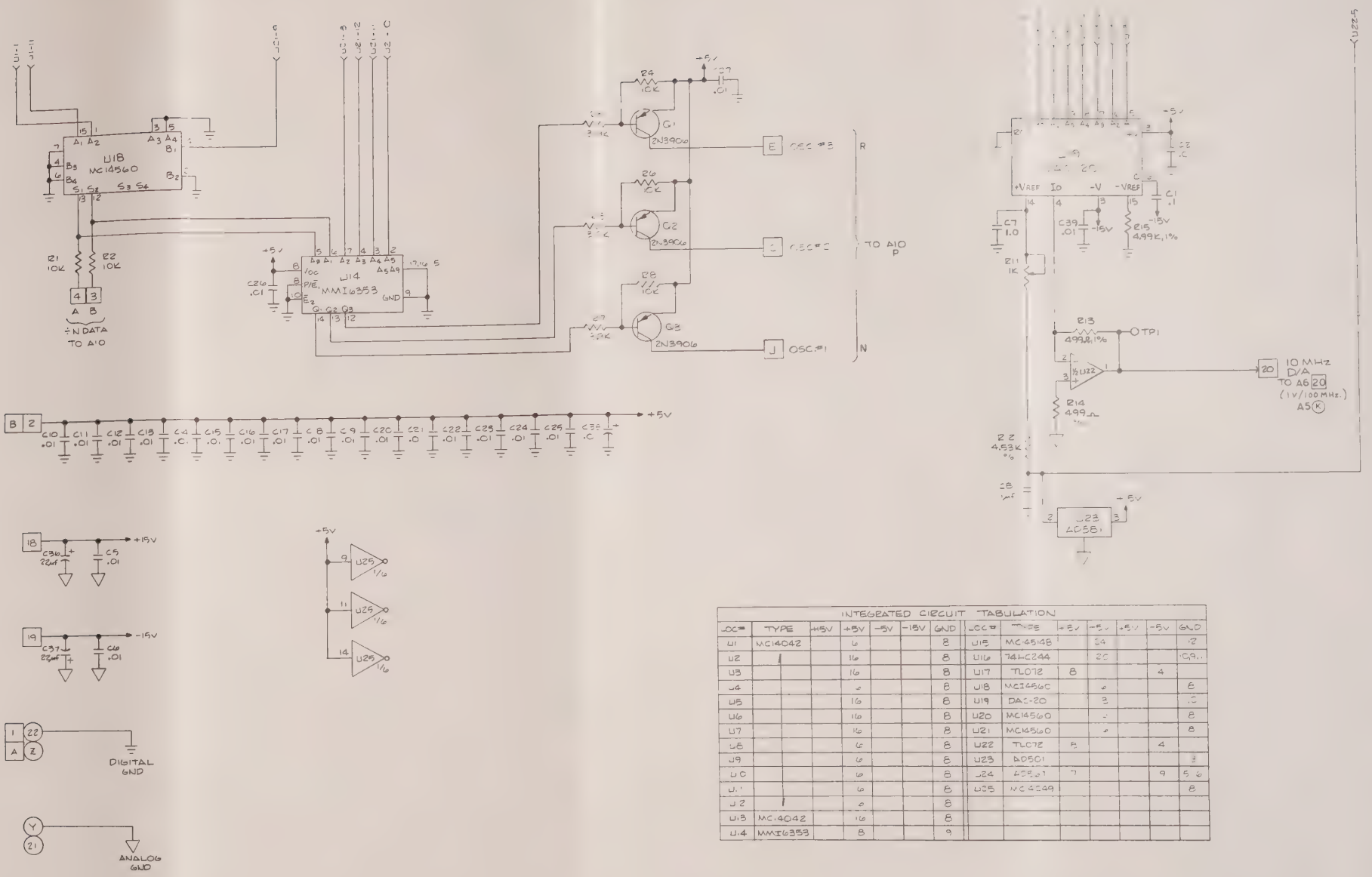


Figure 5-13. Frequency Control A7 (Standard/Option 03) Schematic (Systron Donner No. 708317401/ 708317402) (Sheet 1 of 2)



INTEGRATED CIRCUIT TABULATION													
LOC#	TYPE	+15V	+5V	-5V	-15V	GND	LOC#	TYPE	+5V	-5V	+5V	-5V	GND
U1	MC14042		16			8	U15	MC6514B		24			12
U2			16			8	U16	74HC244		20			10,9..
U3			16			8	U17	TL072	8			4	
U4			16			8	U18	MC14560		16			8
U5			16			8	U19	DAI-20		3			10
U6			16			8	U20	MC14560		16			8
U7			16			8	U21	MC14560		16			8
U8			16			8	U22	TL072	8			4	
U9			16			8	U23	AD501					3
U10			16			8	U24	AD581	7			9	5 6
U11			16			8	U25	MC4049					8
U12			16			8							
U13	MC14042		16			8							
U14	MMI6353		8			9							

Figure 5-13. Frequency Control A7 (Standard/Option 03) Schematic (Systron Donner No. 708317401/ 708317402) (Sheet 2 of 2)

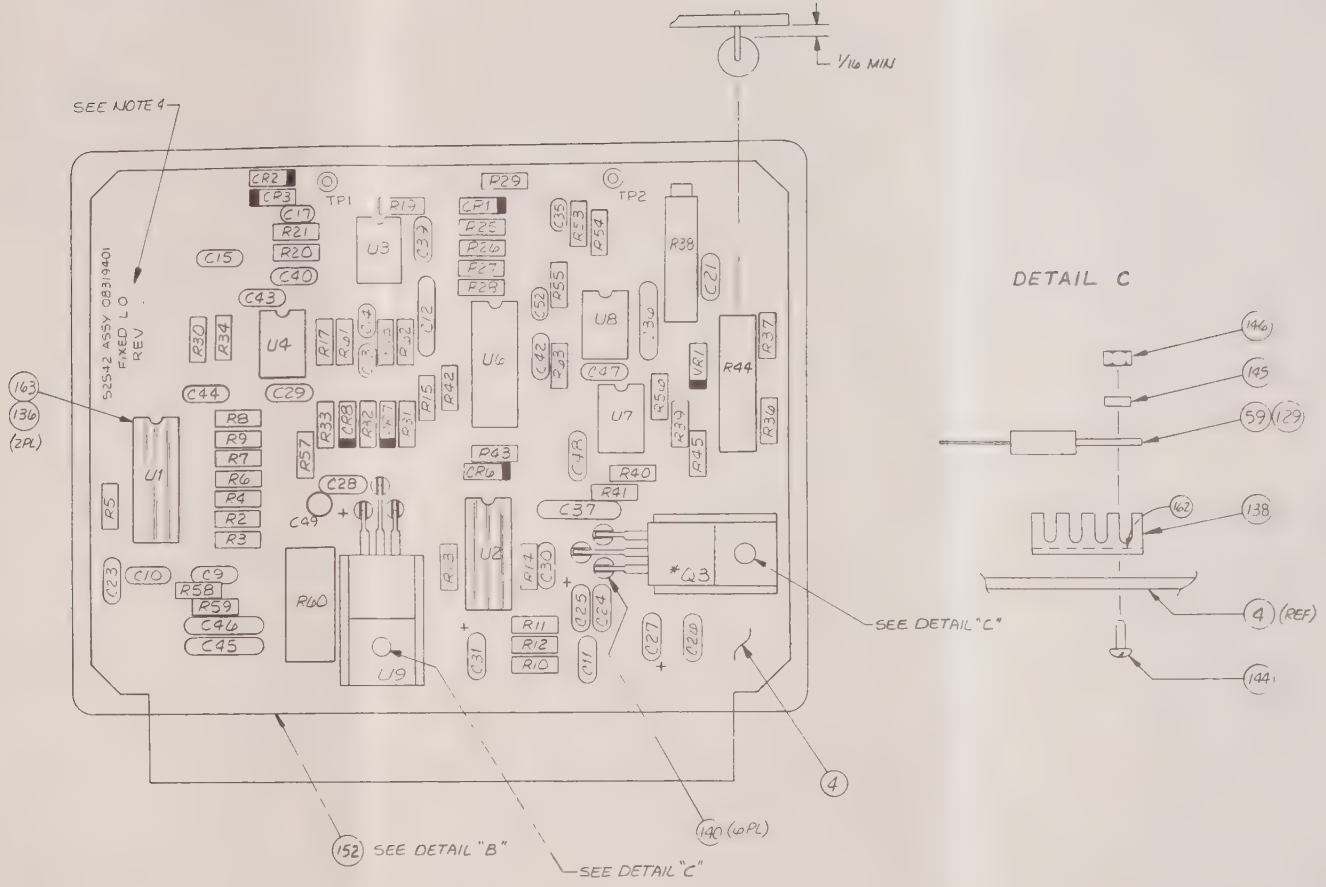
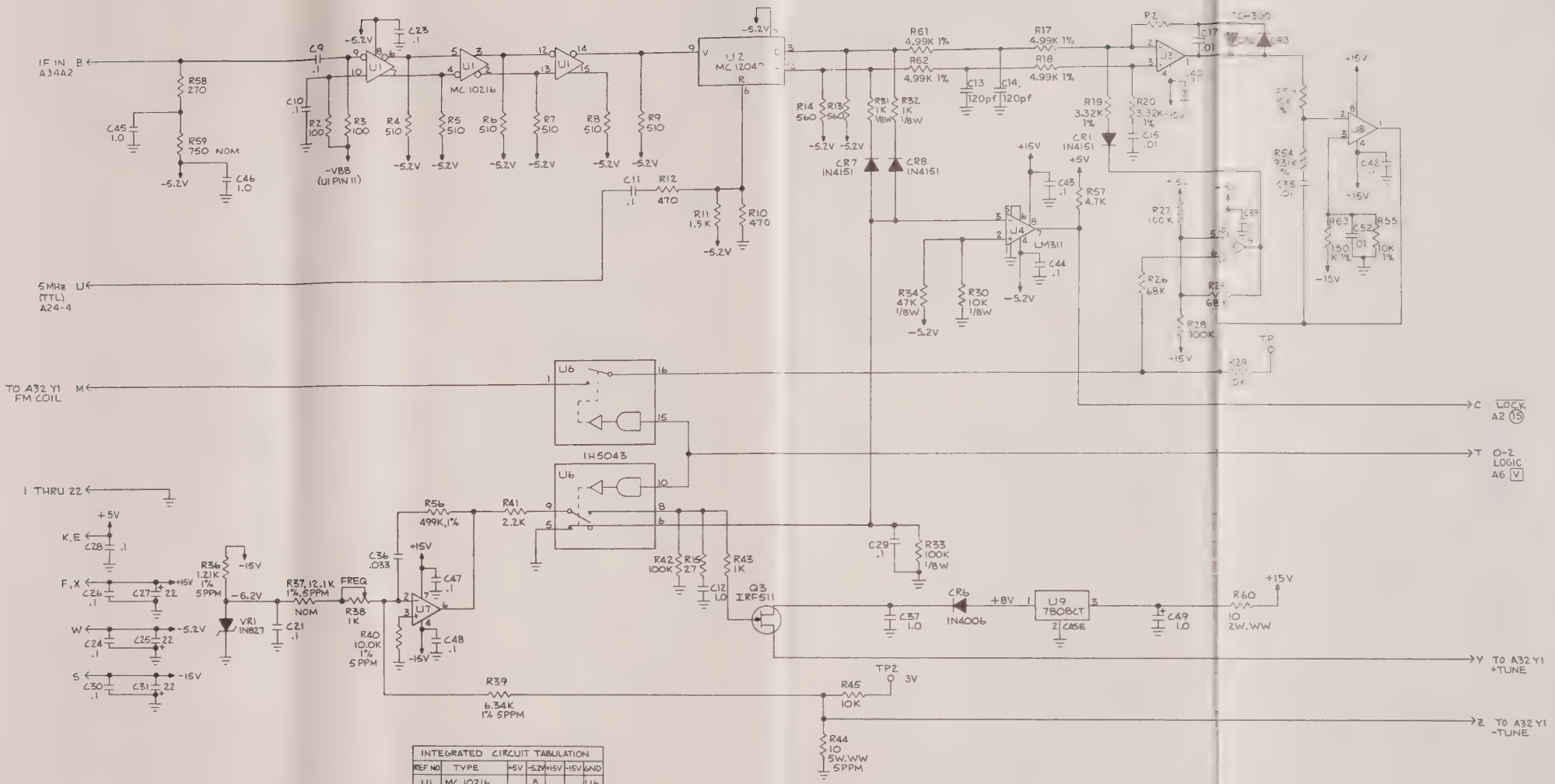


Figure 5-14. Fixed Local Oscillator Phase-Locked Loop A8 P.C. Board Assembly (Systron Donner No. 08319401)



INTEGRATED CIRCUIT TABULATION						
REF NO	TYPE	+5V	-5.2V	+15V	-15V	GND
U1	MC 10216		8			1,16
U2	MC 12040		7			1,14
U3	NE 5532			8	4	
U4	LM311					
U6	1H5043	12		11	14	13
U7	AD542LH			7	4	
U8	NE5532			8	4	

NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 5%.

Figure 5-15. Fixed Local Oscillator Phase-Locked Loop A8 Schematic (Systron Donner No. 708319401)

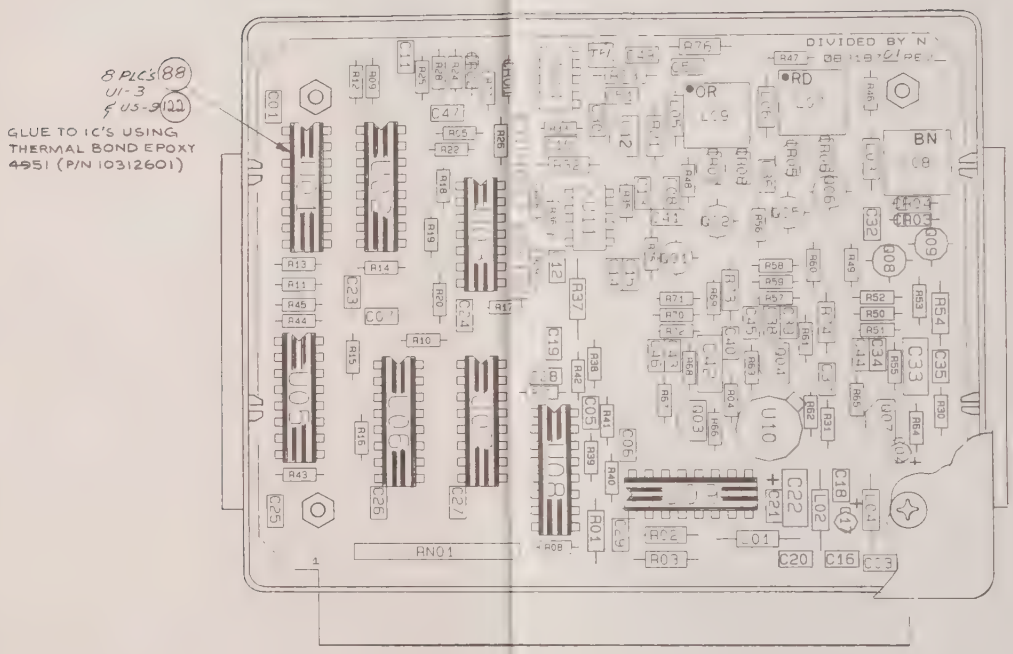
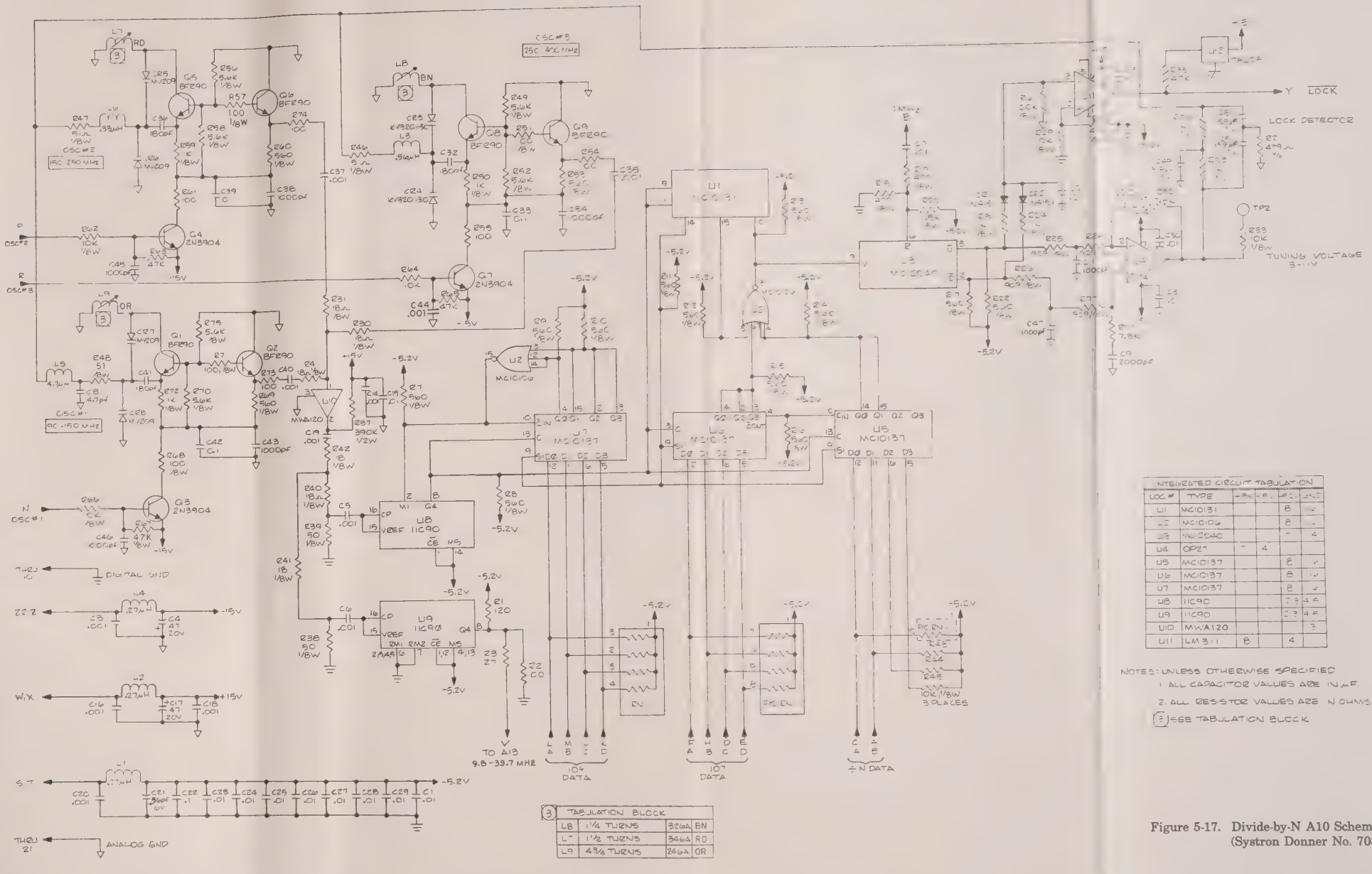


Figure 5-16. Divide-by-N A10 P.C. Board Assembly (Systron Donner No. 08318701)



INTEGRATED CIRCUIT TABULATION					
LOC #	TYPE				
U1	MC10131			8	
U2	MC10106			8	
U3	MC2040				4
U4	OP27		4		
U5	MC10137			8	
U6	MC10137			8	
U7	MC10137			8	
U8	11C90				
U9	11C90				
U10	MWA120				
U11	LM311	8		4	

NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL CAPACITOR VALUES ARE IN μF.
2. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 5%
3. SEE TABULATION BLOCK

3	TABULATION BLOCK		
LB	1¼ TURNS	32GA	BN
L7	1½ TURNS	34GA	RD
L9	43/4 TURNS	24GA	OR

Figure 5-17. Divide-by-N A10 Schematic (Systron Donner No. 708318701)

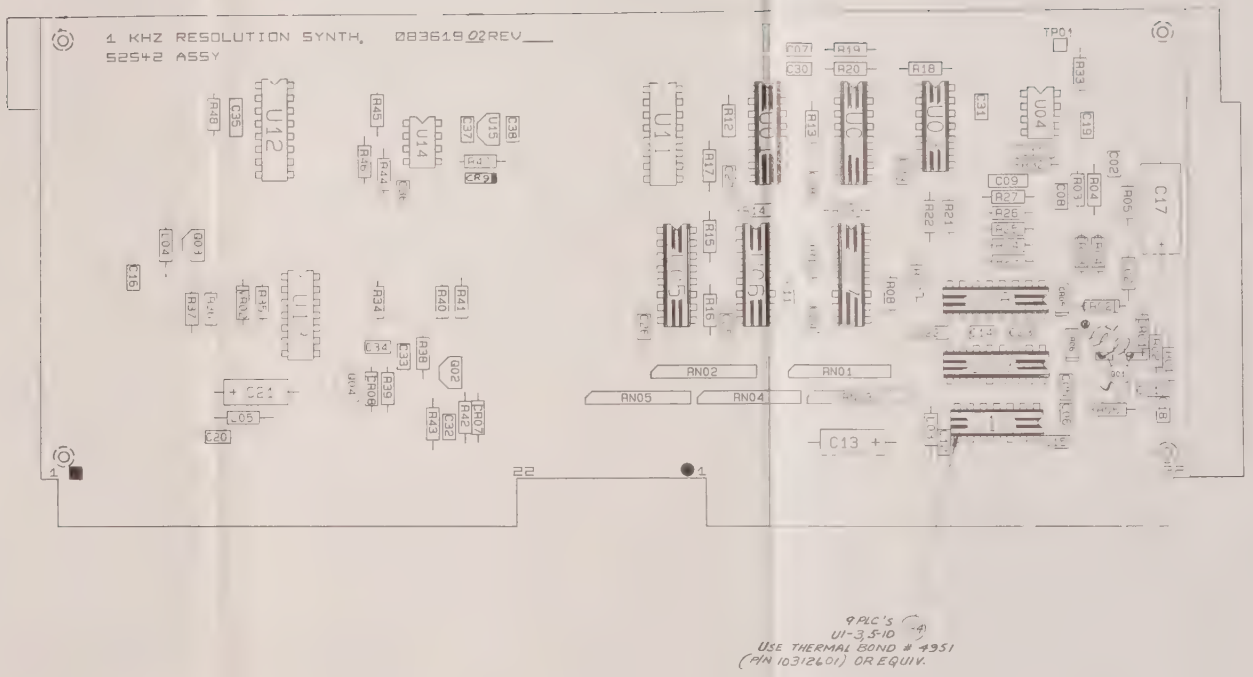
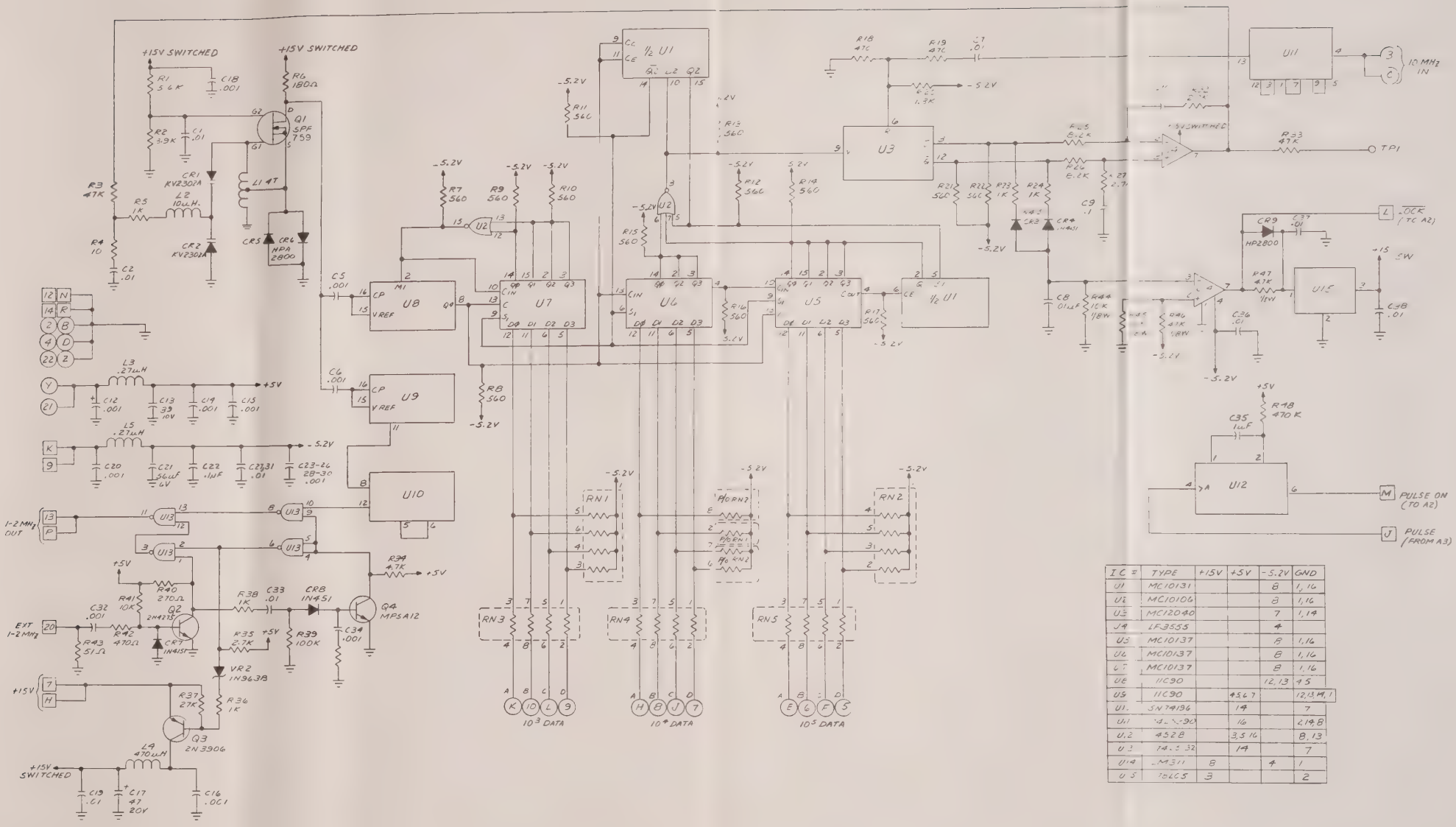


Figure 5-18. 1 kHz Resolution Synthesizer A11 (Option 03) P.C. Board Assembly (Systron Donner No. 08361902)



IC #	TYPE	+15V	+5V	-5.2V	GND
U1	MC10131			8	1, 16
U2	MC10106			8	1, 16
U3	MC12040			7	1, 14
U4	LF355S			4	
U5	MC10137			8	1, 16
U6	MC10137			8	1, 16
U7	MC10137			8	1, 16
U8	11C90			12, 13	4 5
U9	11C90		4567		12, 13 M, 1
U10	SN74196		14		7
U11	74LS90		16		2, 14, 8
U12	4528		3, 5, 16		8, 13
U13	74LS32		14		7
U14	LM311	8		4	1
U15	75LC5	3			2

Figure 5-19. 1 kHz Resolution Synthesizer A11 (Option 03) Schematic (Systron Donner No. 708361902)

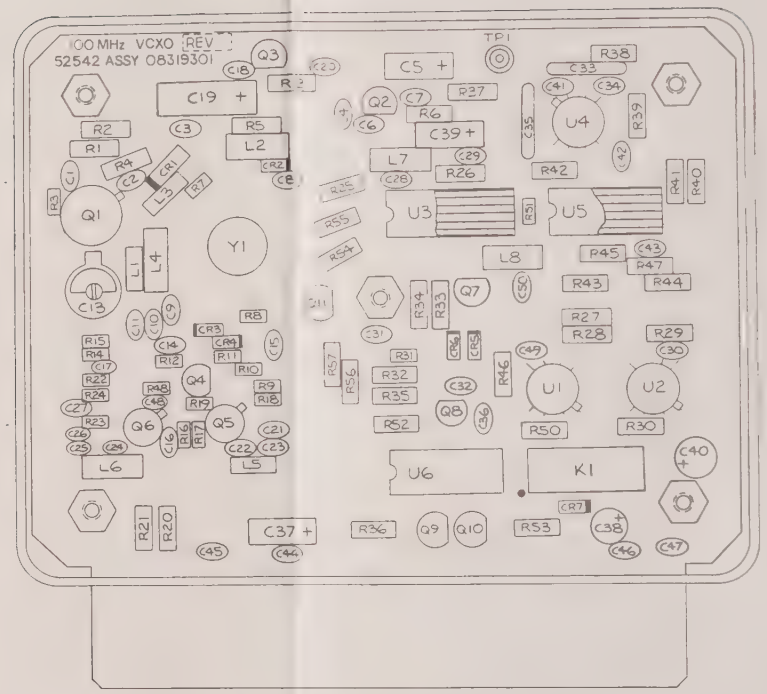


Figure 5-20. 100 MHz Voltage Controlled Crystal Oscillator A12 P.C. Board Assembly (Systron Donner No. 08319301)

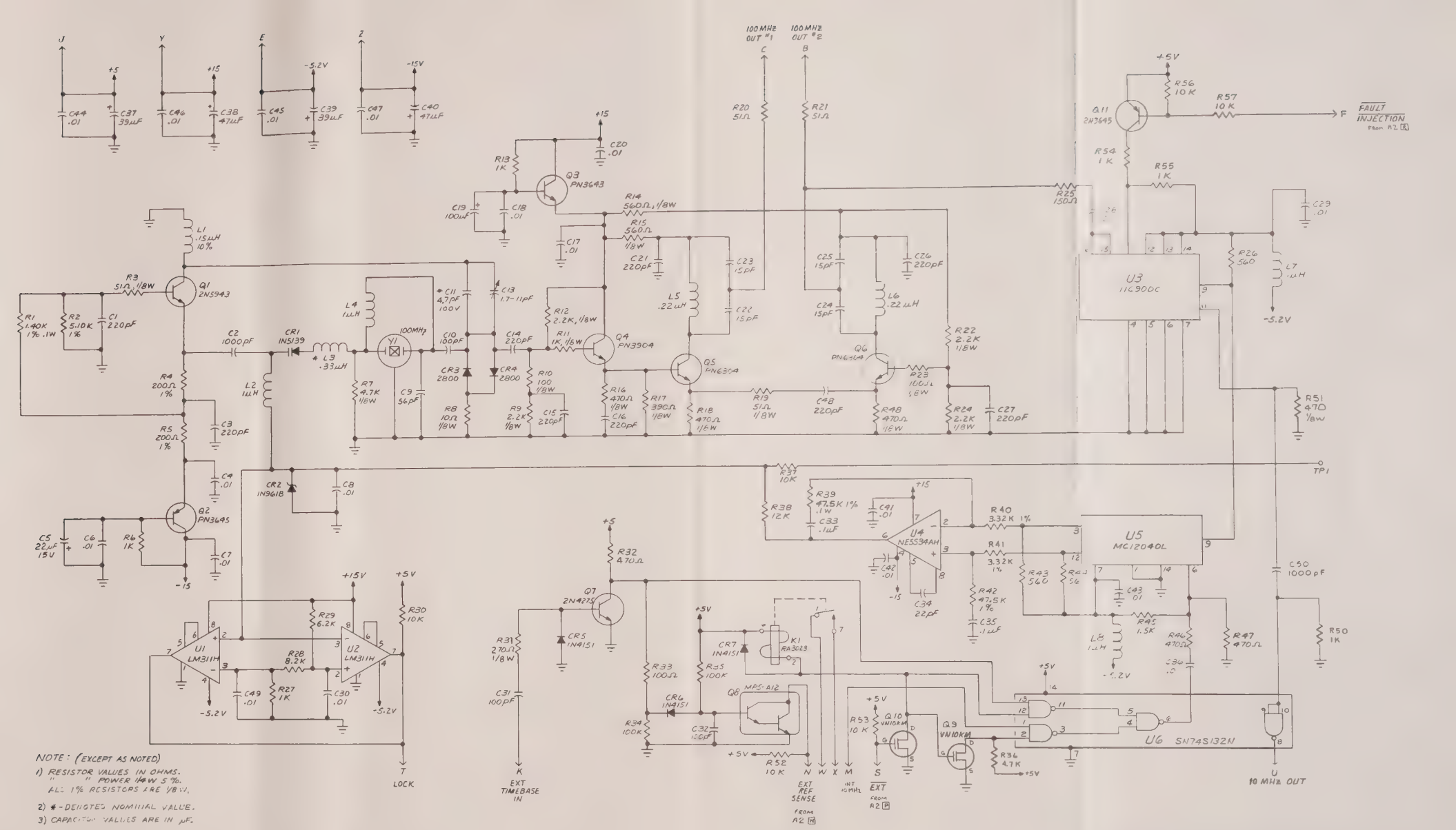
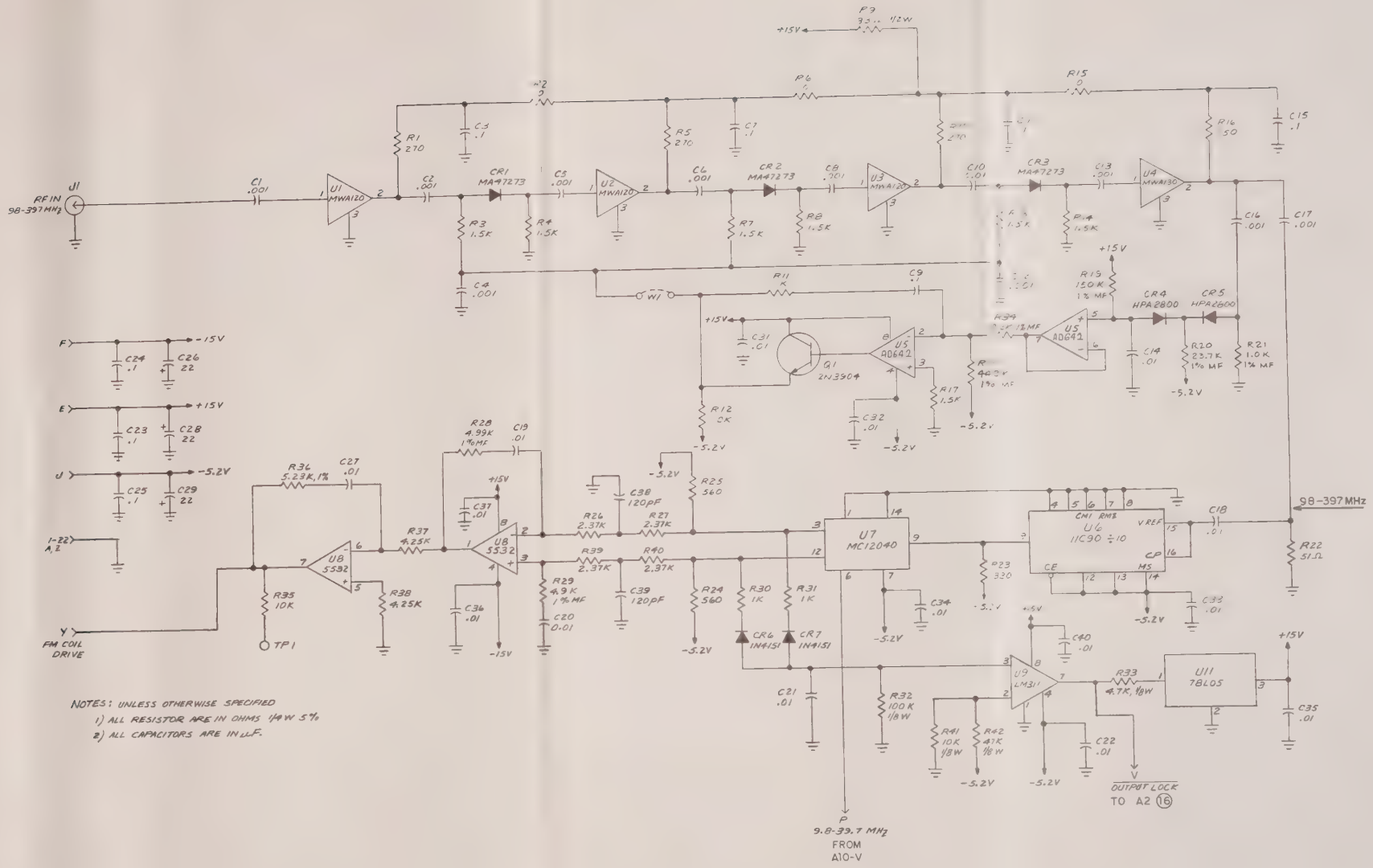


Figure 5-21. 100 MHz Voltage Controlled Crystal Oscillator A12 Schematic (Systron Donner No. 708319301)

Figure 5-22. Output Phase-Locked Loop A13 P.C. Board Assembly (Systron Donner No. 08319201)



NOTES: UNLESS OTHERWISE SPECIFIED
1) ALL RESISTOR ARE IN OHMS 1/4W 5%
2) ALL CAPACITORS ARE IN μF.

Figure 5-23. Output Phase-Locked Loop A13 Schematic (Systron Donner No. 708319201)

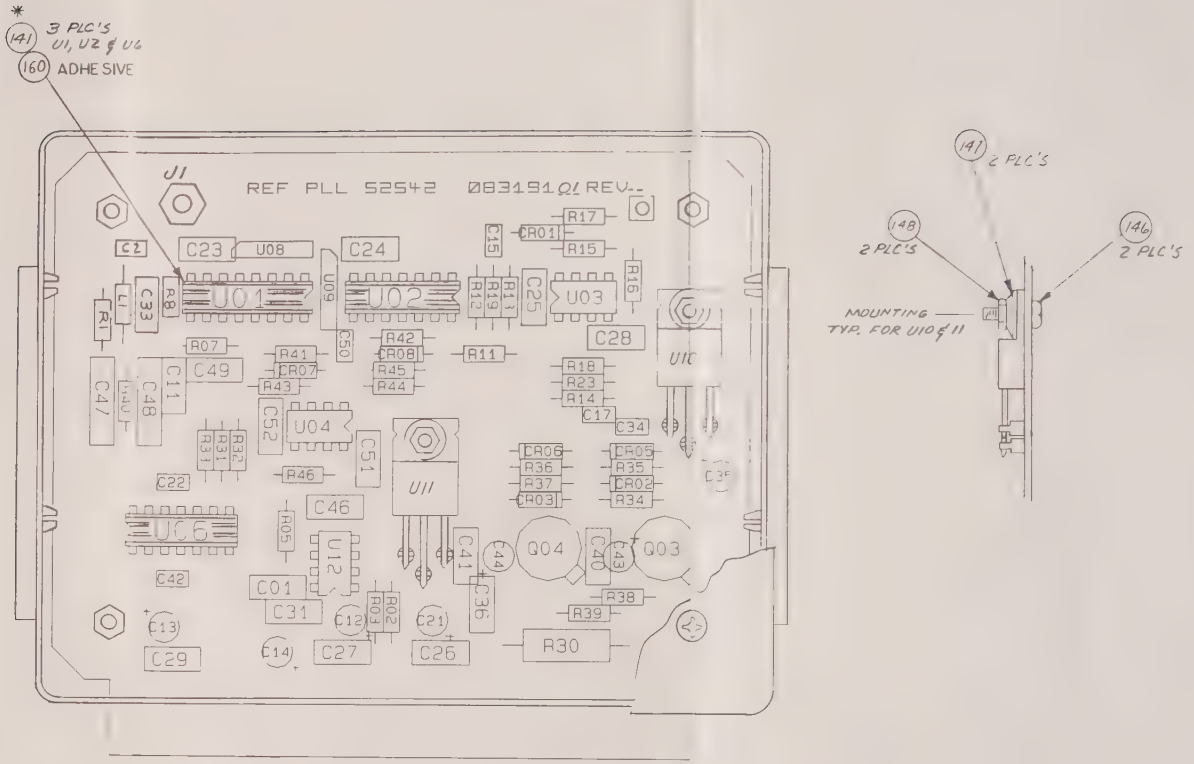
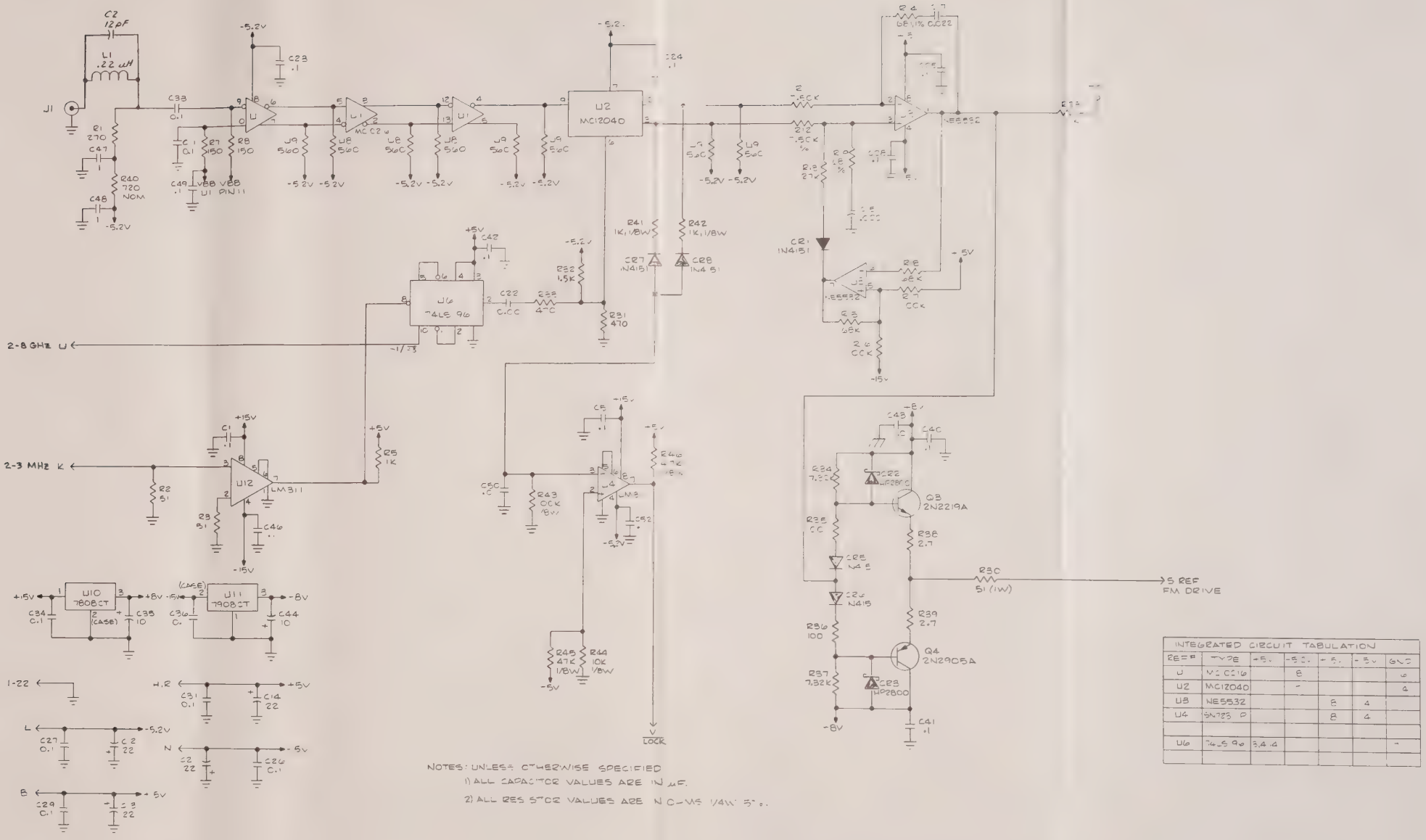


Figure 5-24. Reference Phase-Locked Loop A14 (Standard) P.C. Board Assembly (Systron Donner No. 08319101)



INTEGRATED CIRCUIT TABULATION						
REF	TYPE	+5	-5.2	+15	-15	GND
U	MC1016		8			6
U2	MC12040		-			4
U8	NE5532			8	4	
U4	SN783 P			8	4	
U6	74LS 96	3,4,14				-

Figure 5-25. Reference Phase-Locked Loop A14 (Standard) Schematic (Systron Donner No. 708319101)

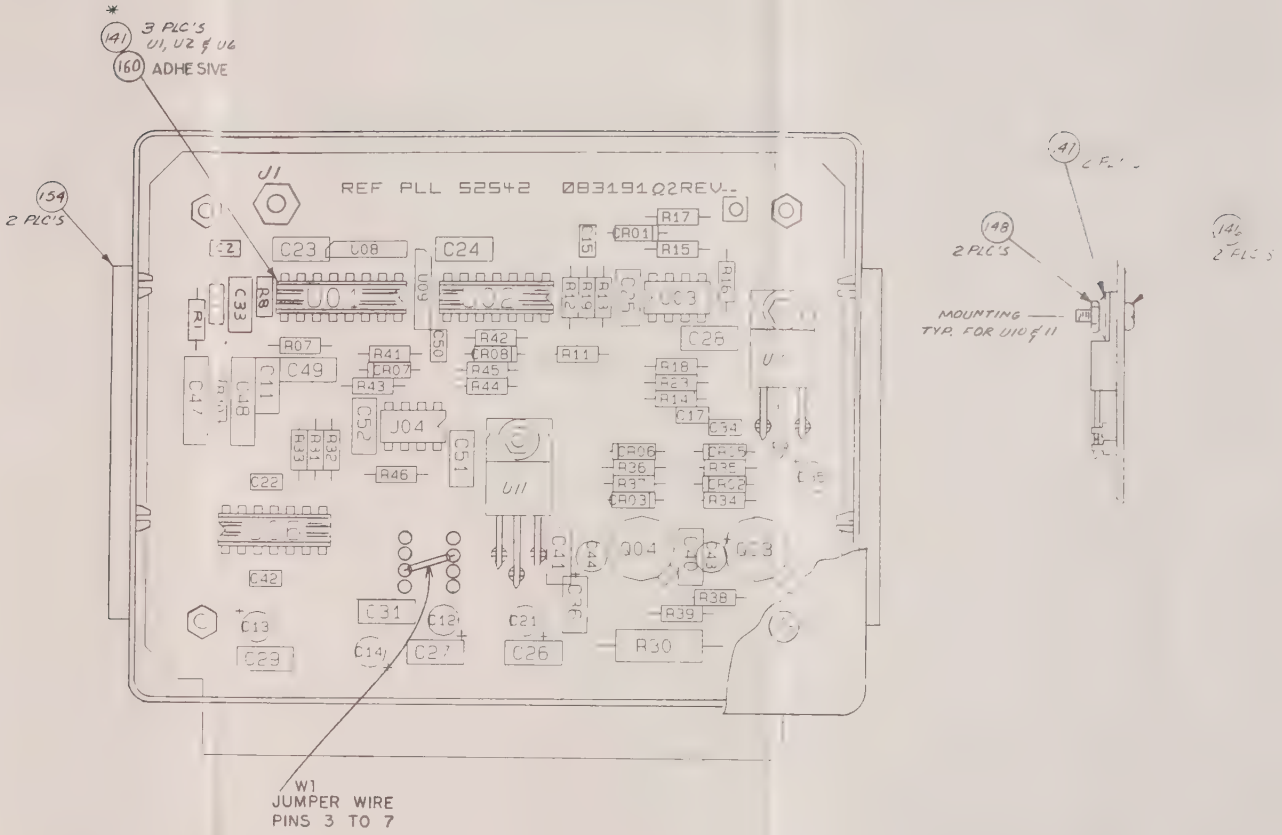
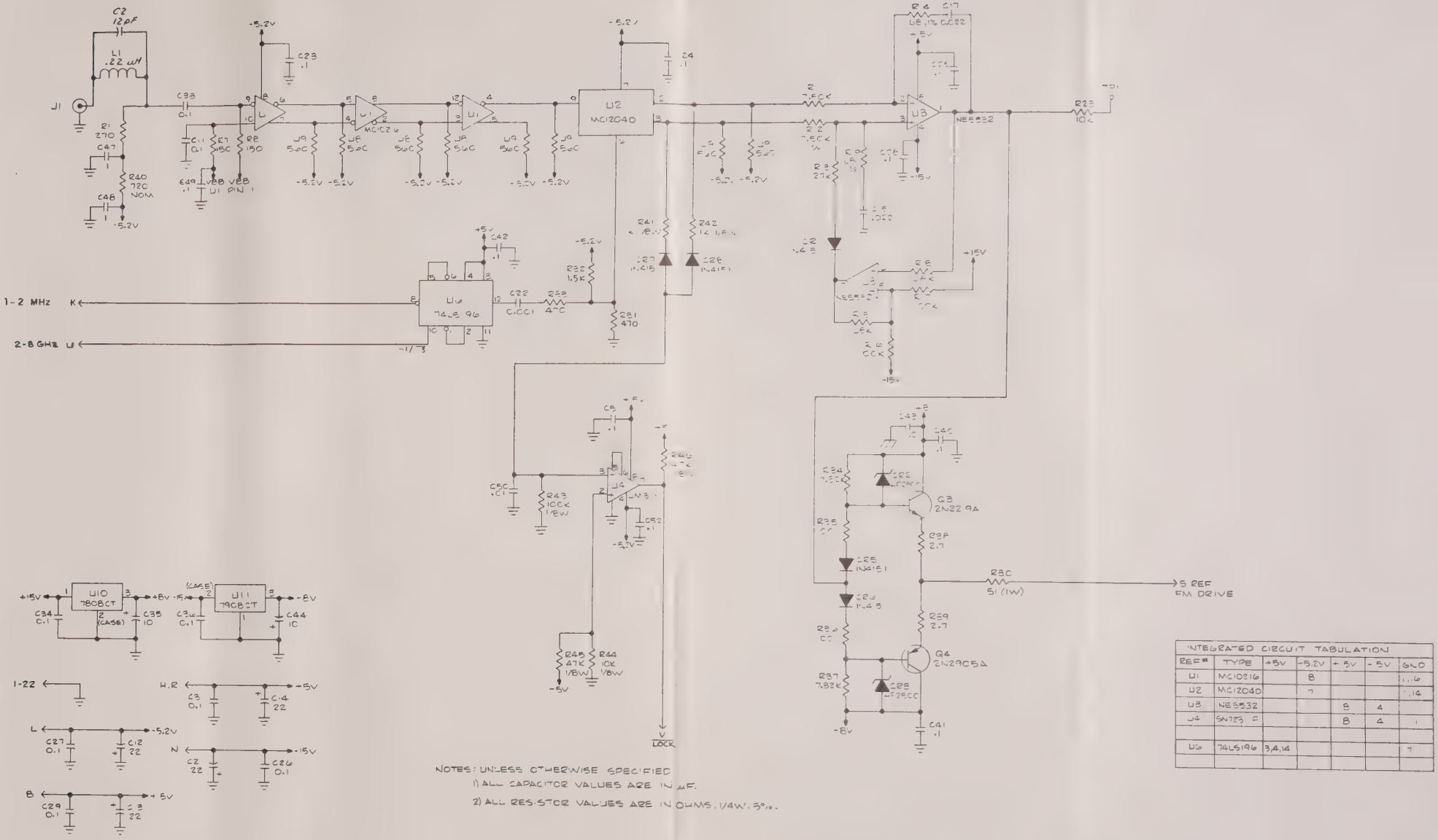


Figure 5-26. Reference Phase-Locked Loop A14 (Option 03) P.C. Board Assembly (Systron Donner No. 08319102)



INTEGRATED CIRCUIT TABULATION						
REF#	TYPE	+5V	-5.2V	+5V	-5V	GND
U1	MC10216		8			1,16
U2	MC12040		7			1,14
U3	NE5532			8	4	
U4	SN7523			8	4	1
U6	74LS196	3,4,16				7

Figure 5-27. Reference Phase-Locked Loop A14 (Option 03) Schematic (Systron Donner No. 708319102)

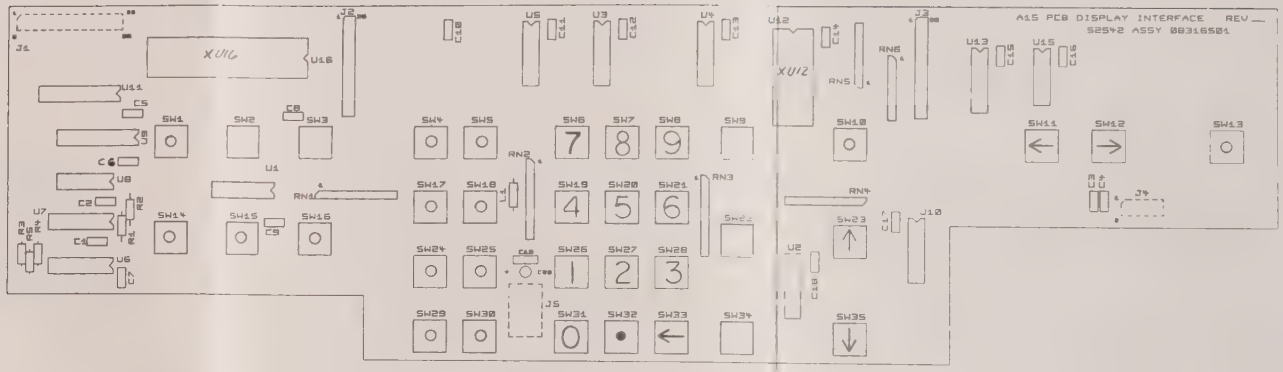


Figure 5-28. Display Interface A15 P.C. Board Assembly (Systron Donner No. 08316501)

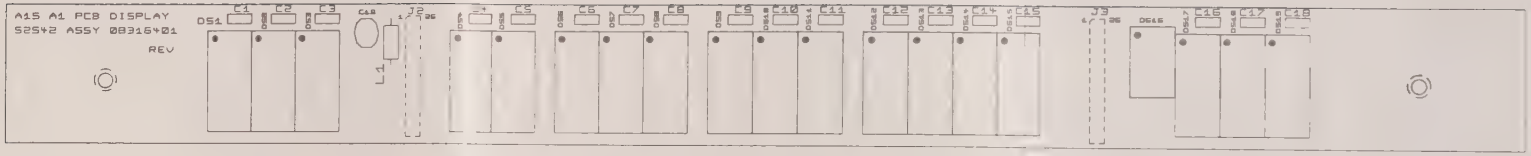


Figure 5-29. Display A15A1 P.C. Board Assembly (Systron Donner No. 08316401)

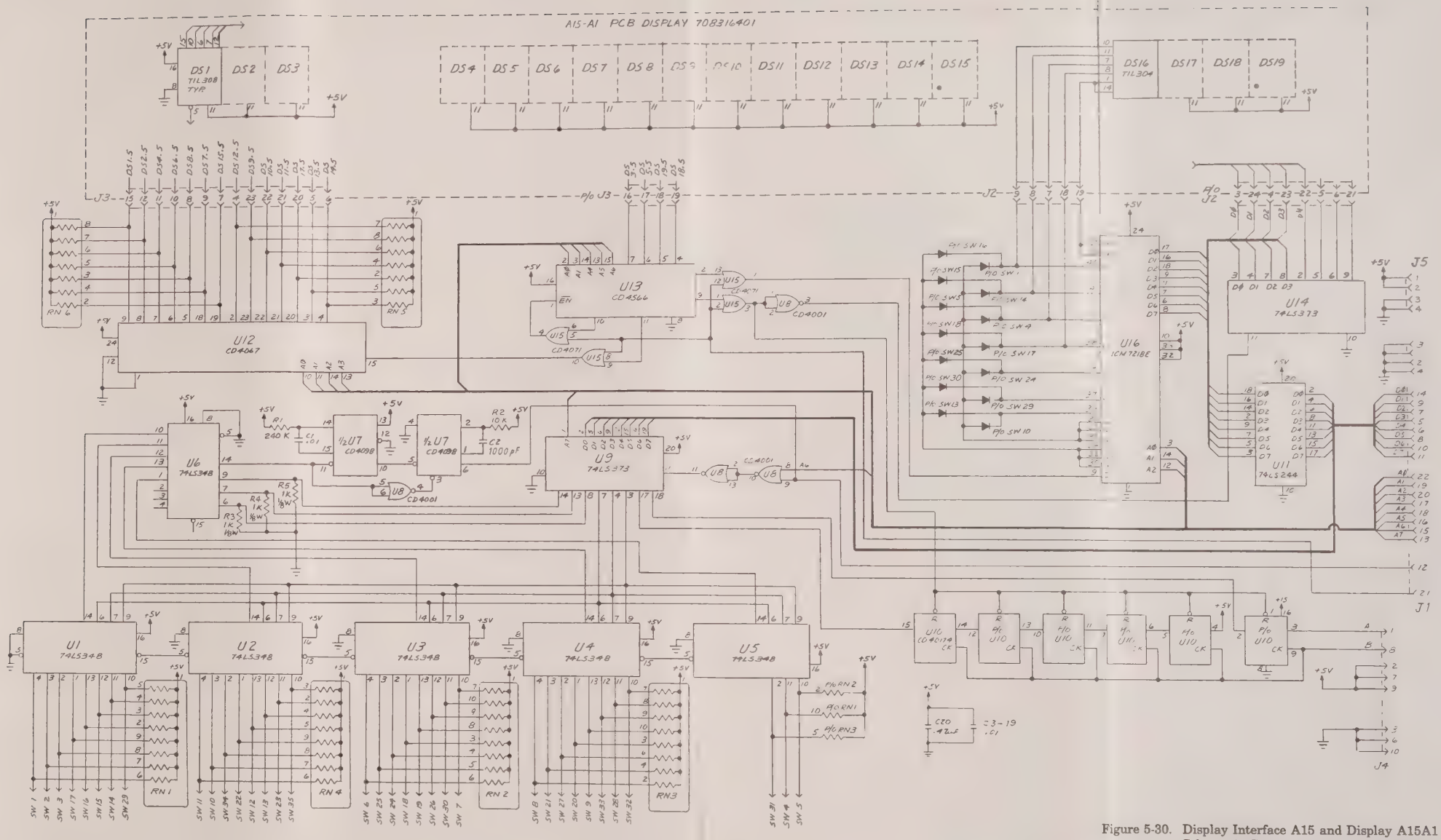


Figure 5-30. Display Interface A15 and Display A15A1 Schematic (Systron Donner No. 708316501)

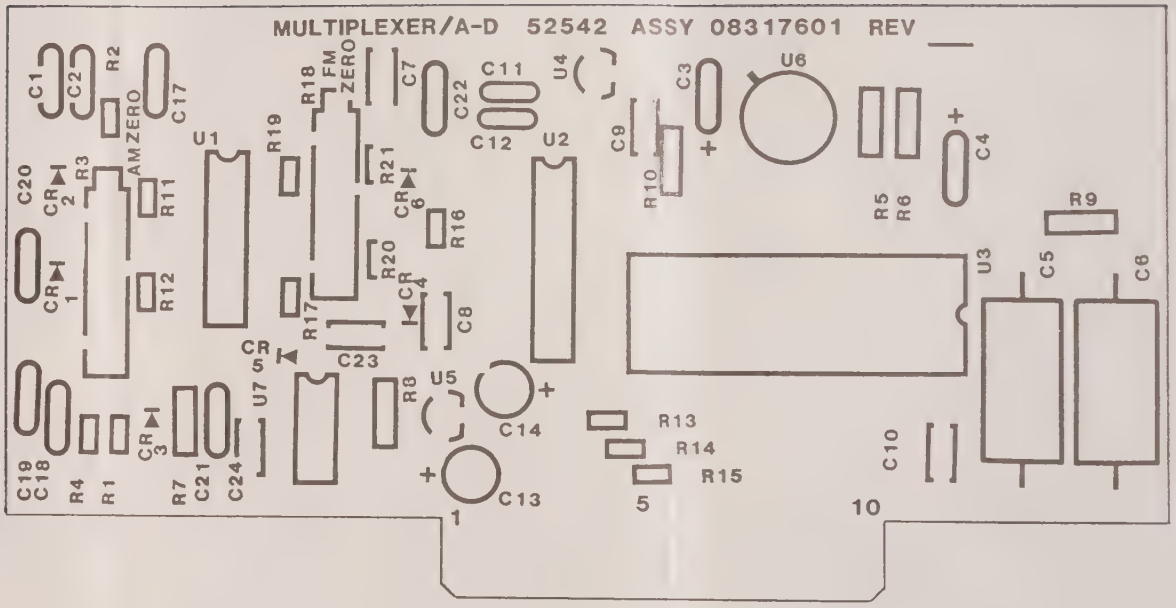


Figure 5-31. Analog-to-Digital and Multiplexer A16 P.C. Board Assembly (Systron Donner No. 08317601)

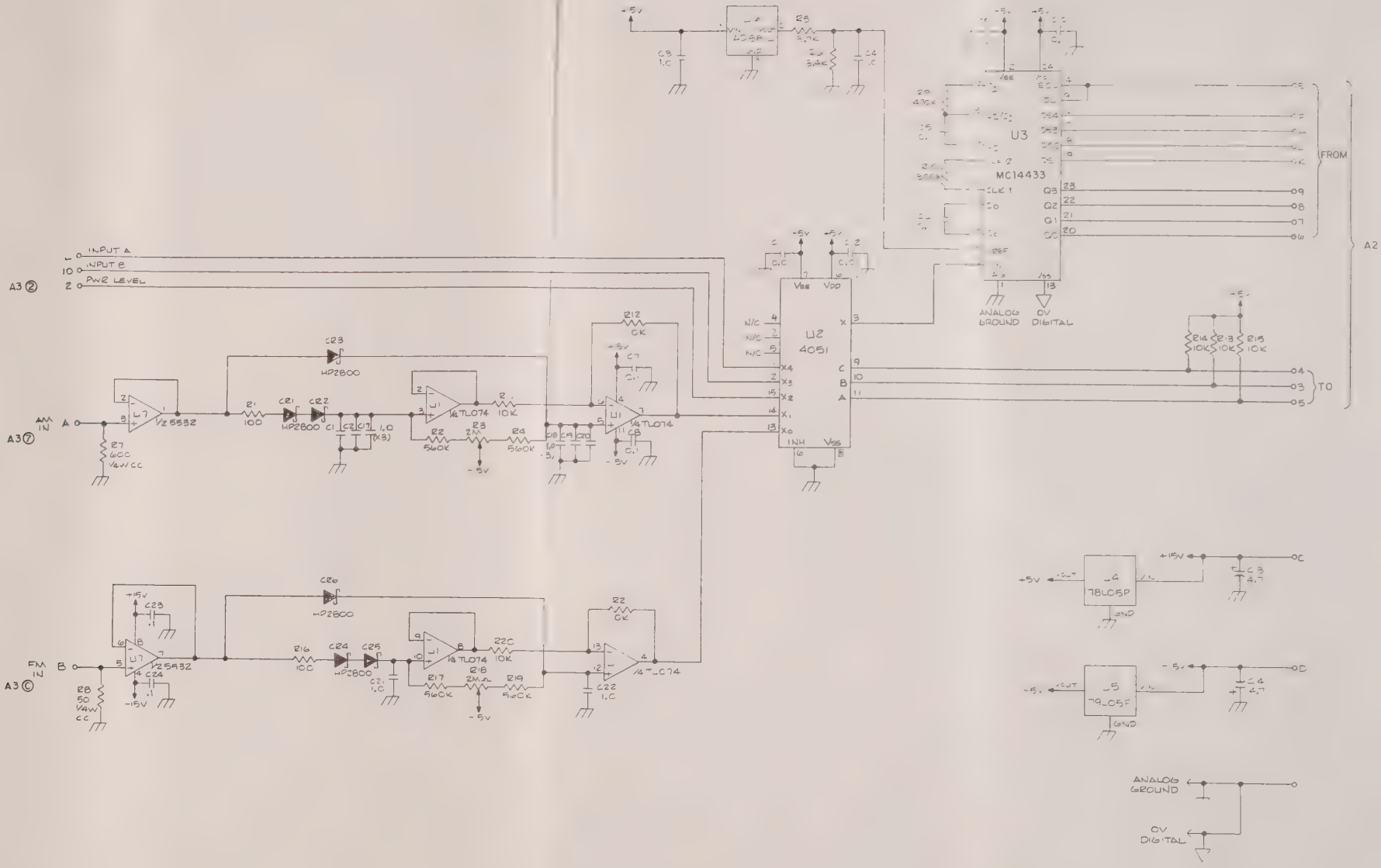
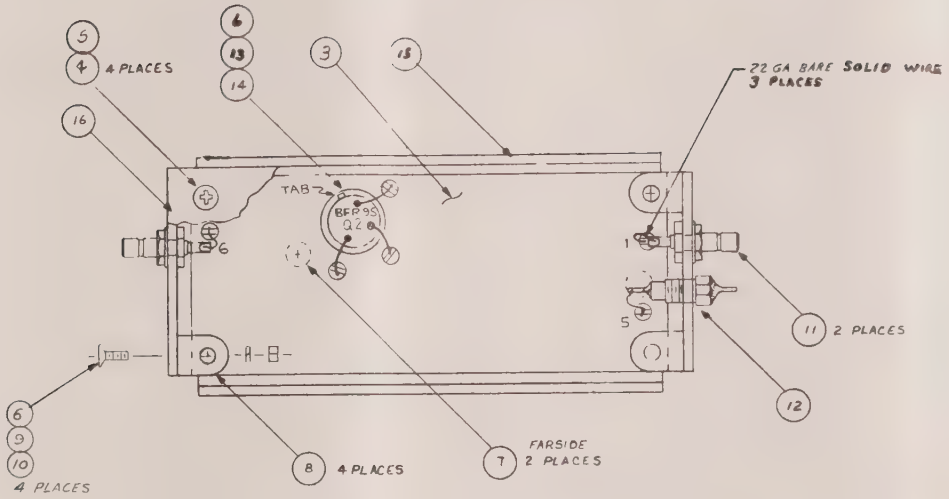


Figure 5-32. Analog-to-Digital and Multiplexer A16 Schematic (Systron Donner No. 708317601)



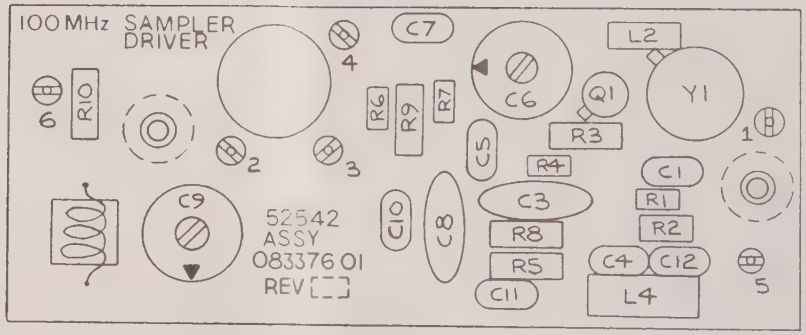


Figure 5-33. Sampler Driver A19/A20 P.C. Board Assembly (Systron Donner No. 08337601)

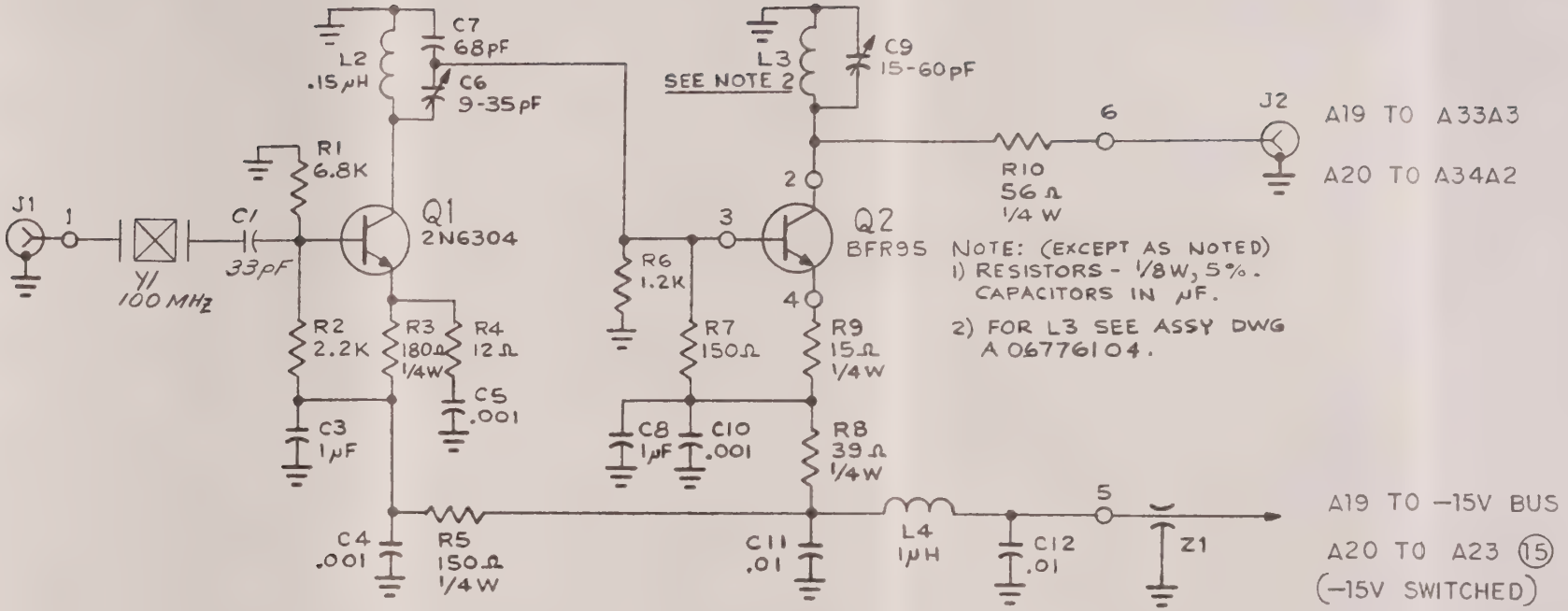


Figure 5-34. Sampler Driver A19/A20 Schematic (Systron Donner No. 708337601)

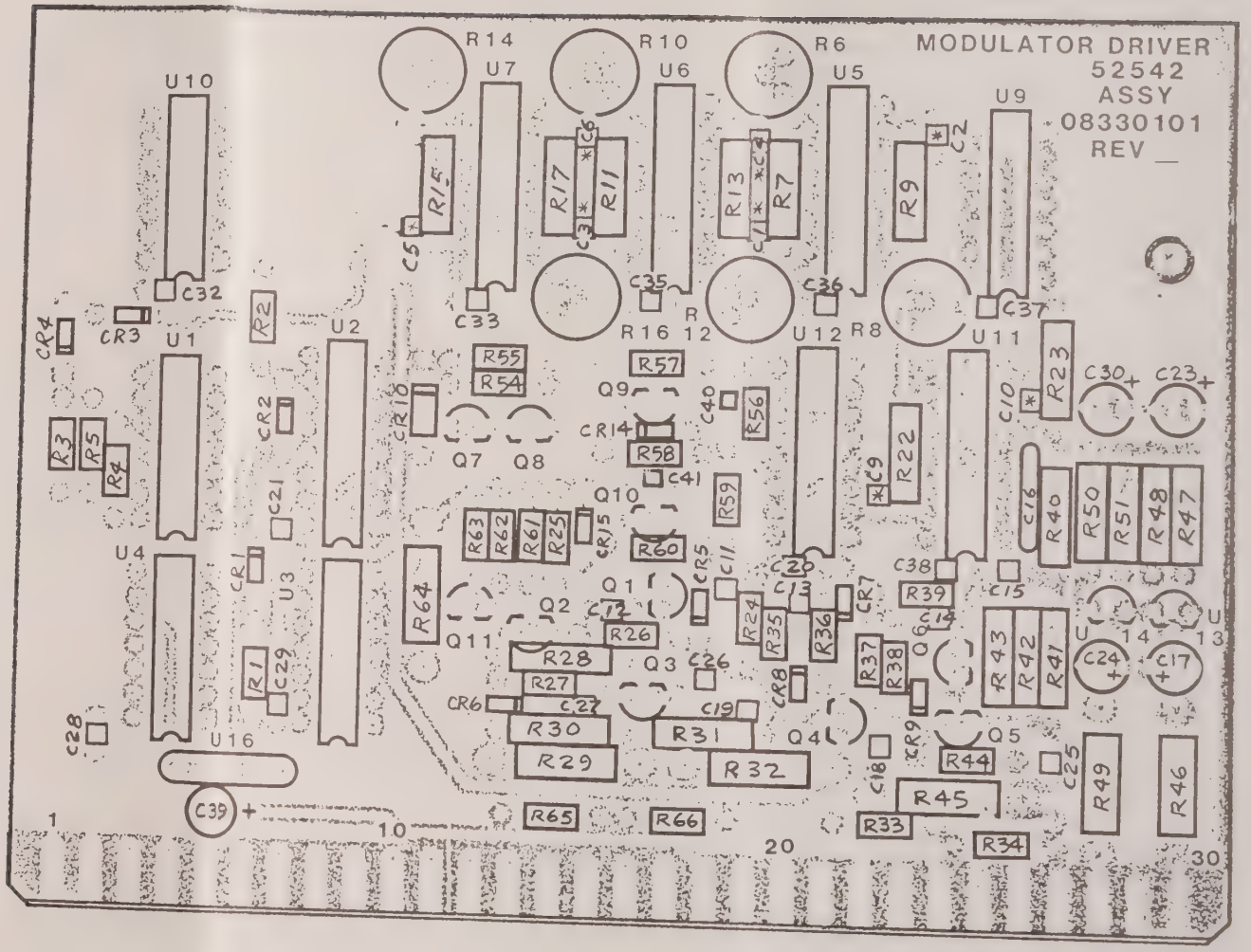


Figure 5-35. Pulse Modulator Driver A23 (Standard) P.C. Board Assembly (Systron Donner No. 08330101)

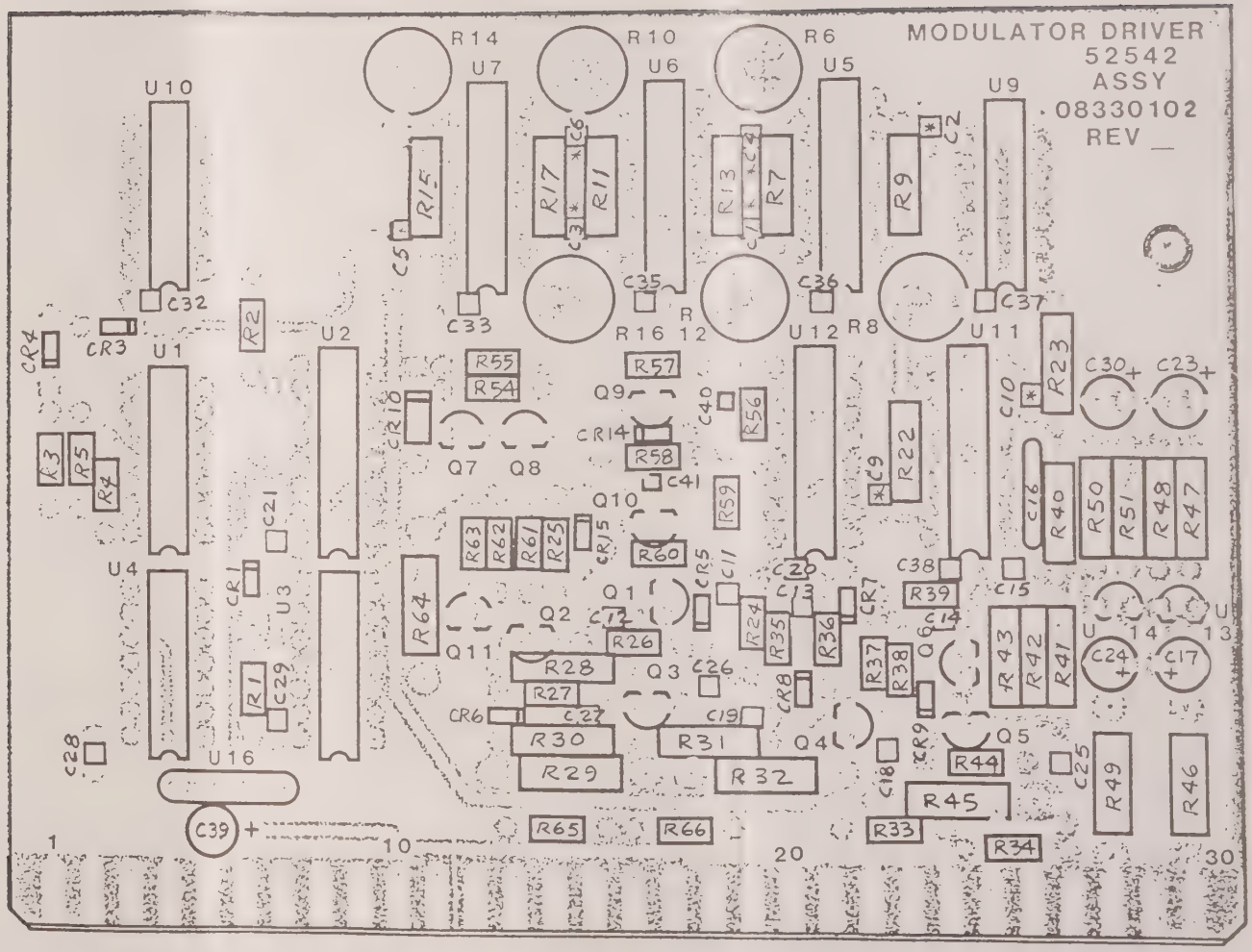
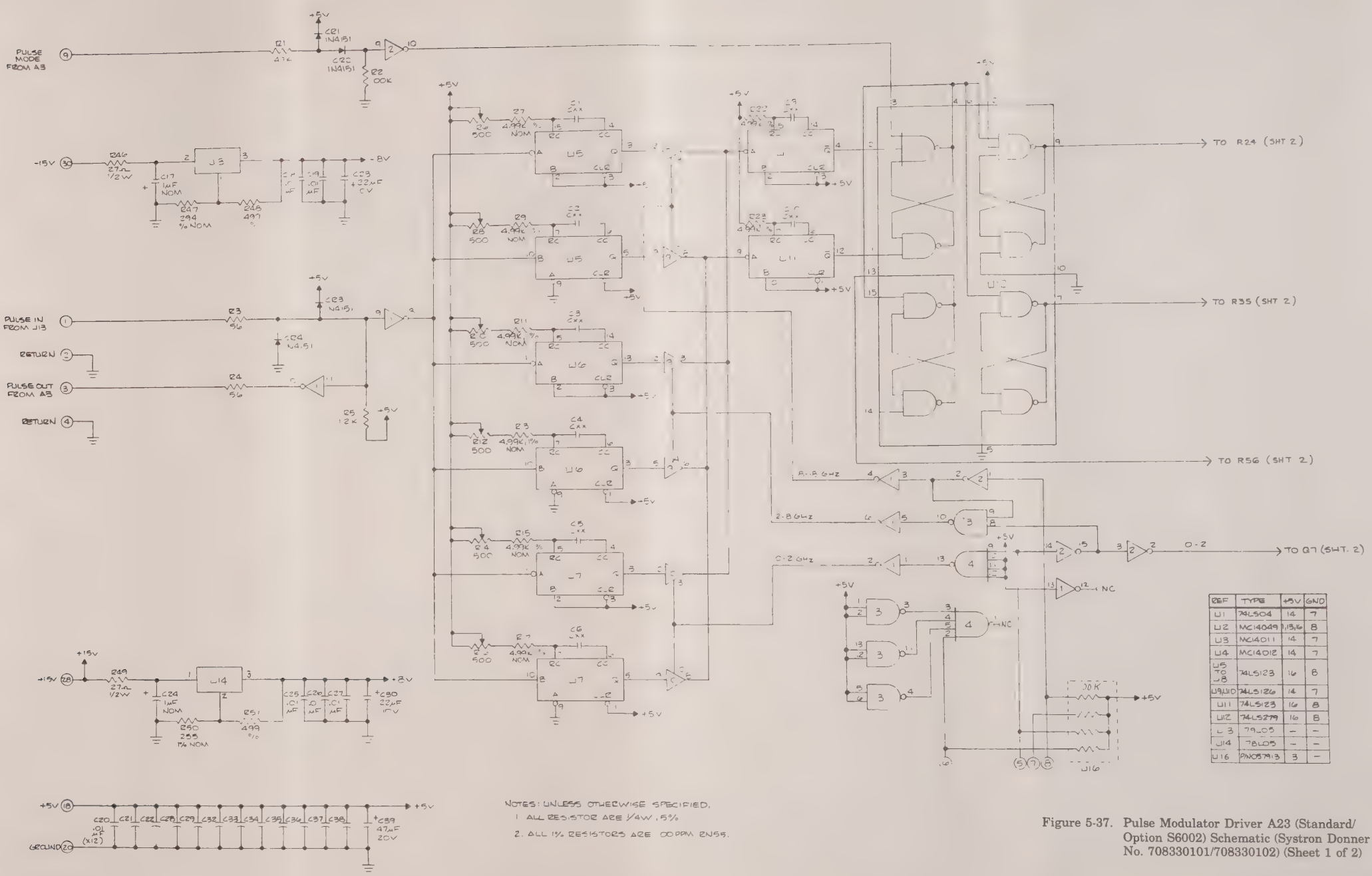


Figure 5-36. Pulse Modulator Driver A23 (Option S6002) P.C. Board Assembly (Systron Donner No. 08330102)



REF	TYPE	+5V	GND
U1	74LS04	14	7
U2	MC14049	13,16	8
U3	MC14011	14	7
U4	MC14012	14	7
U5 TO U8	74LS123	16	8
U9,U10	74LS126	14	7
U11	74LS123	16	8
U12	74LS279	16	8
U 3	79_05	–	–
U14	78L05	–	–
U16	PN05713	3	–

NOTES: UNLESS OTHERWISE SPECIFIED,
1. ALL RESISTOR ARE 1/4W, 5%
2. ALL 1% RESISTORS ARE 100PPM RNSS.

Figure 5-37. Pulse Modulator Driver A23 (Standard/ Option S6002) Schematic (Systron Donner No. 708330101/708330102) (Sheet 1 of 2)

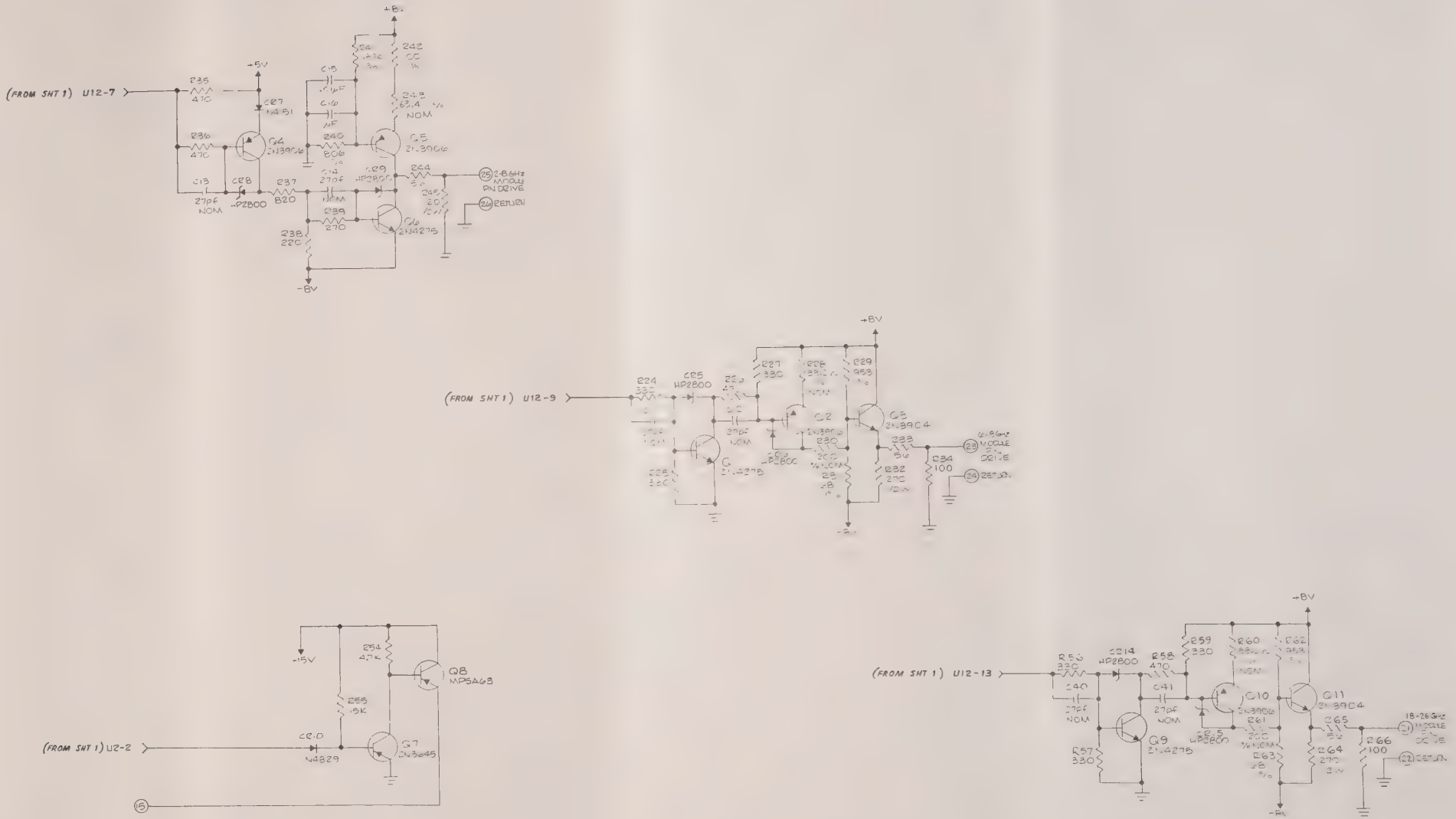
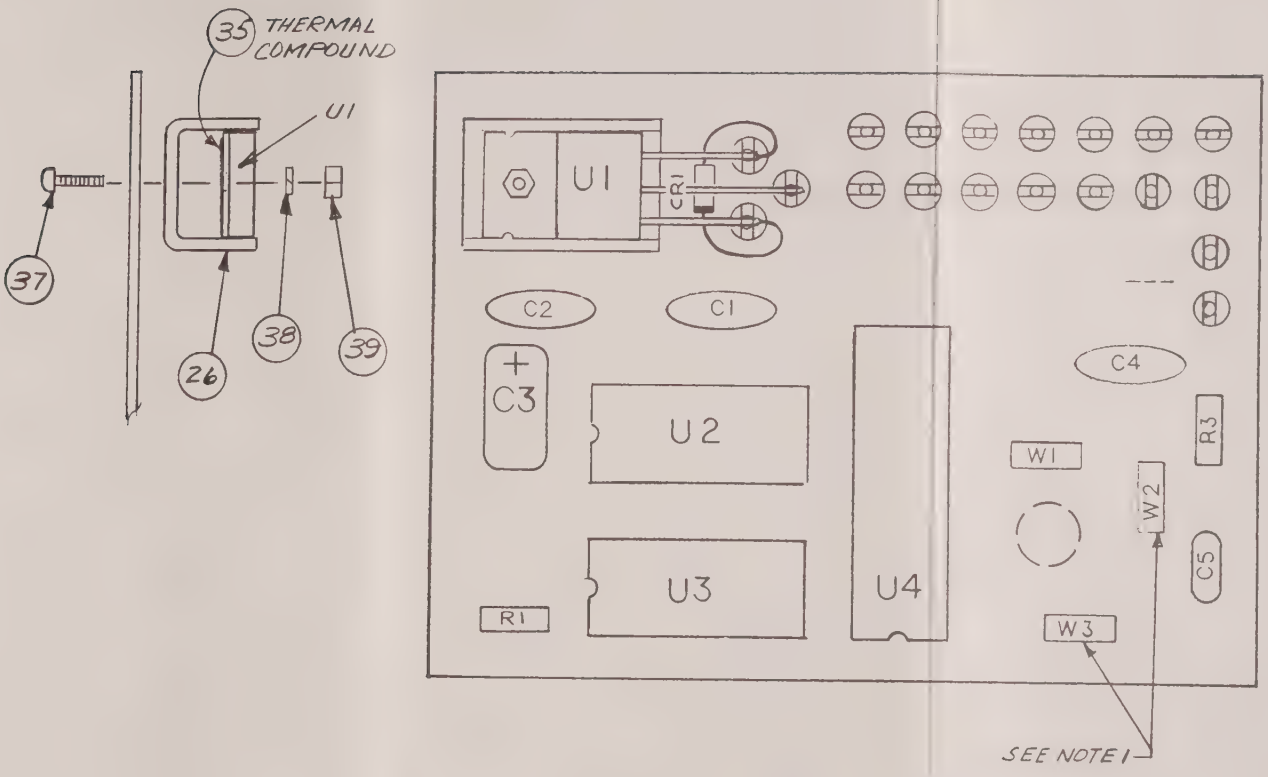


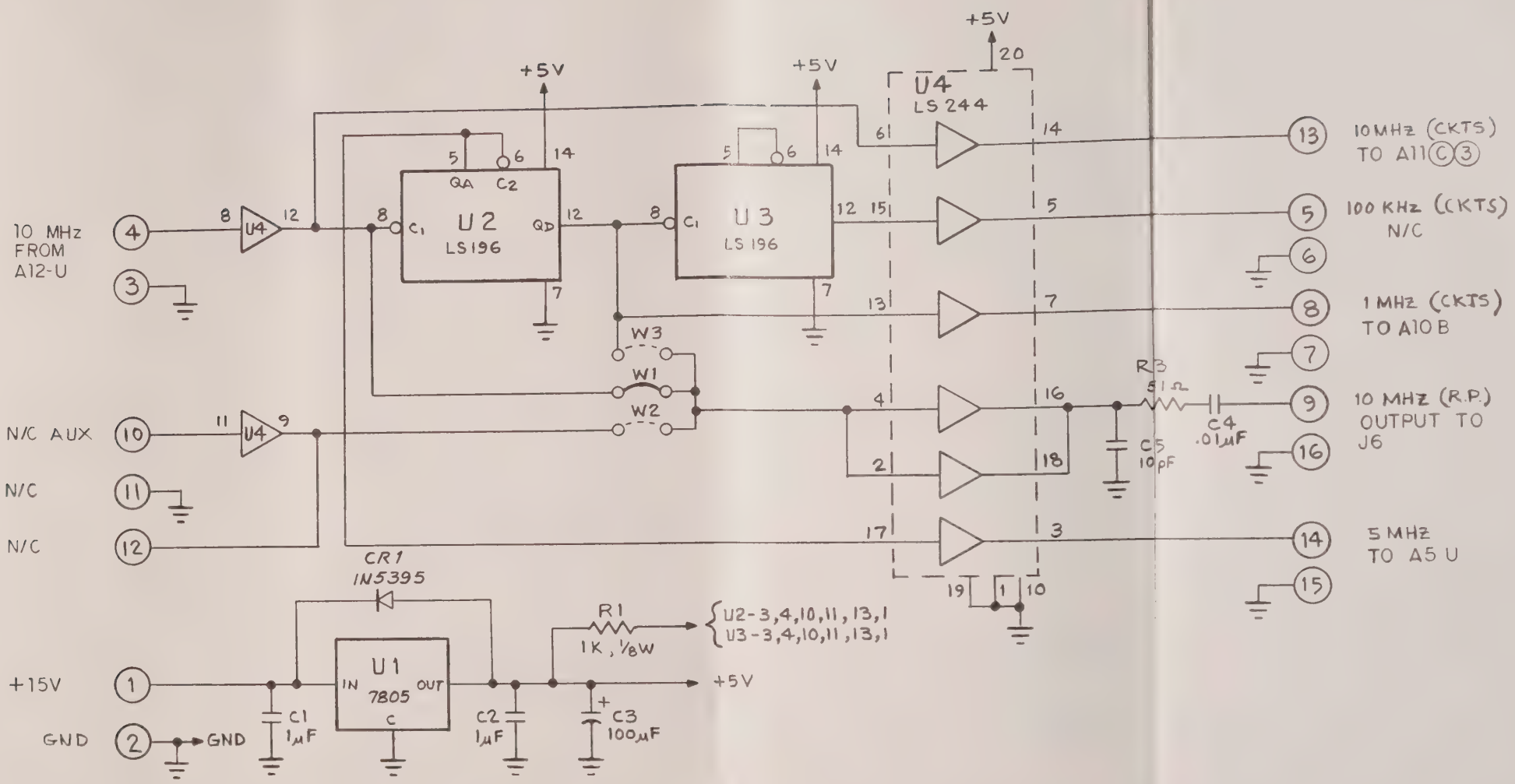
Figure 5-37. Pulse Modulator Driver A23 (Standard/ Option S6002) Schematic (Systron Donner No. 708330101/708330102) (Sheet 2 of 2)



NOTES:

1) JUMPERS USED IN W2 & W3 POSITIONS WITH SPECIAL OPTIONS ONLY

Figure 5-38. Timebase Divider A24 P.C. Board Assembly (Systron Donner No. 08317701)



NOTE:

1. JUMPER W1 FITTED AS STANDARD. W2 & W3 ARE NOT INSTALLED.

Figure 5-39. Timebase Divider A24 Schematic (Systron Donner No. 708317701)

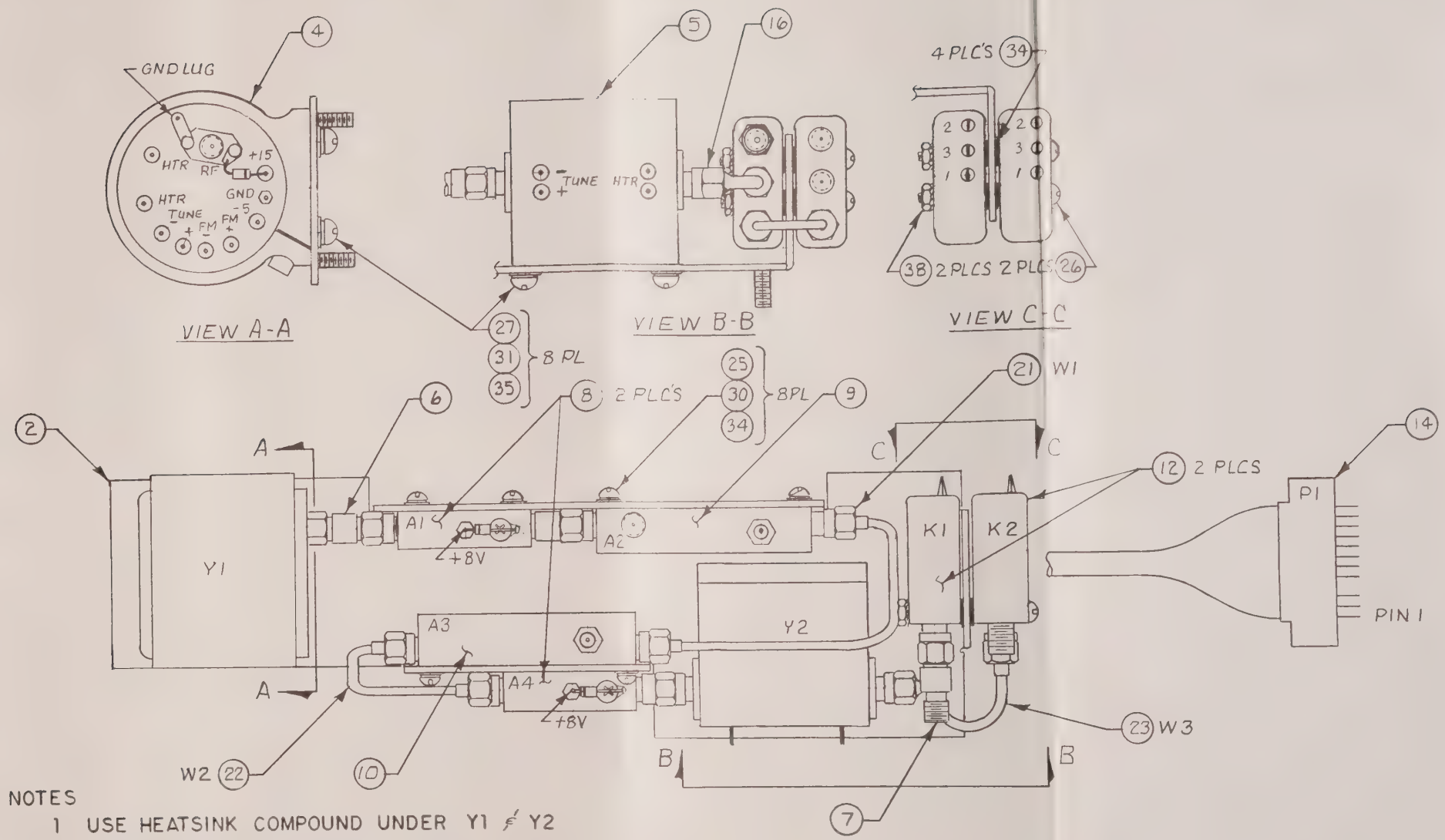


Figure 5-40. 2 — 8 GHz Output Bracket A31 (Systron Donner No. 08320101)

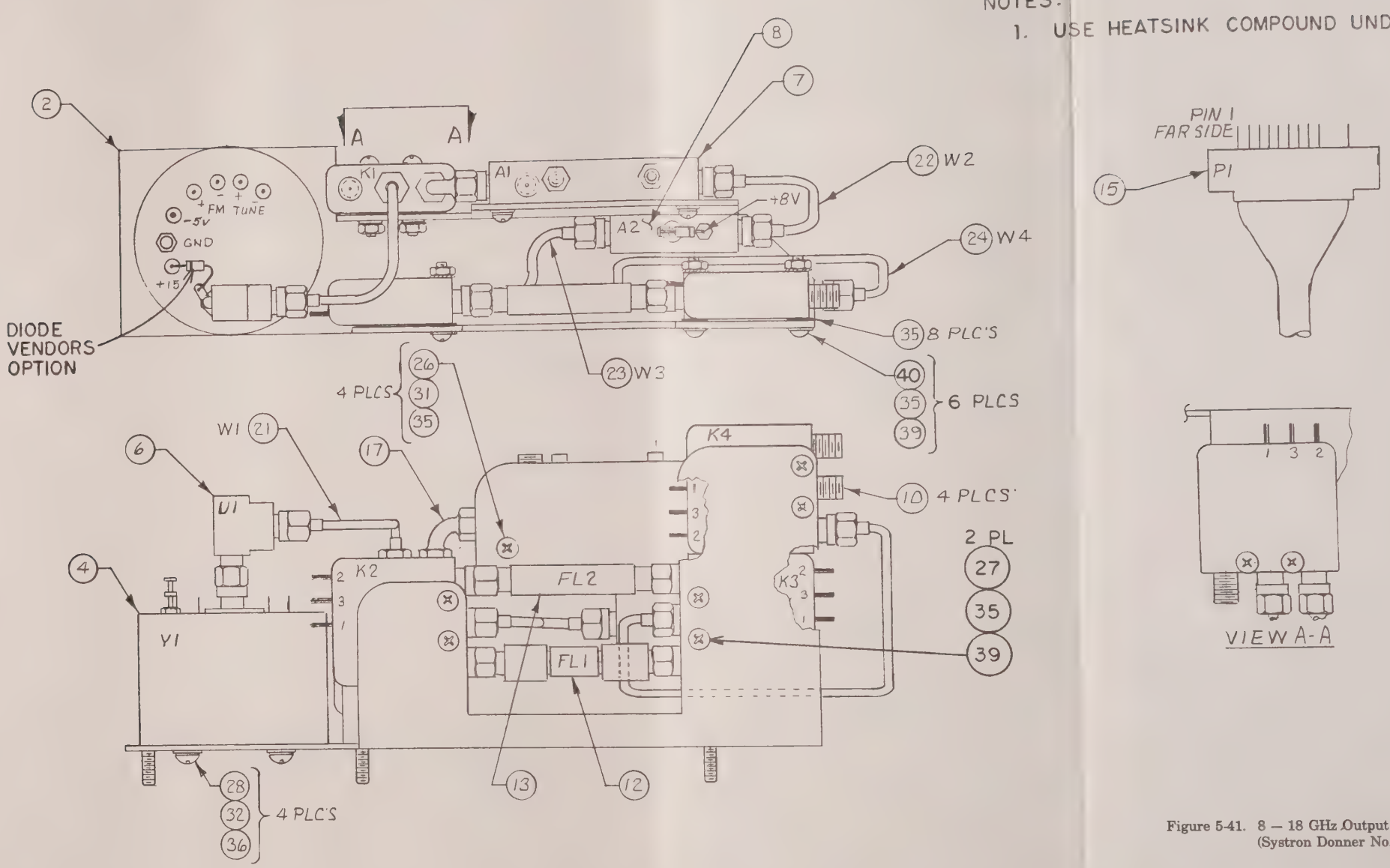


Figure 5-41. 8 — 18 GHz Output Bracket A32 (Systron Donner No. 08320201)

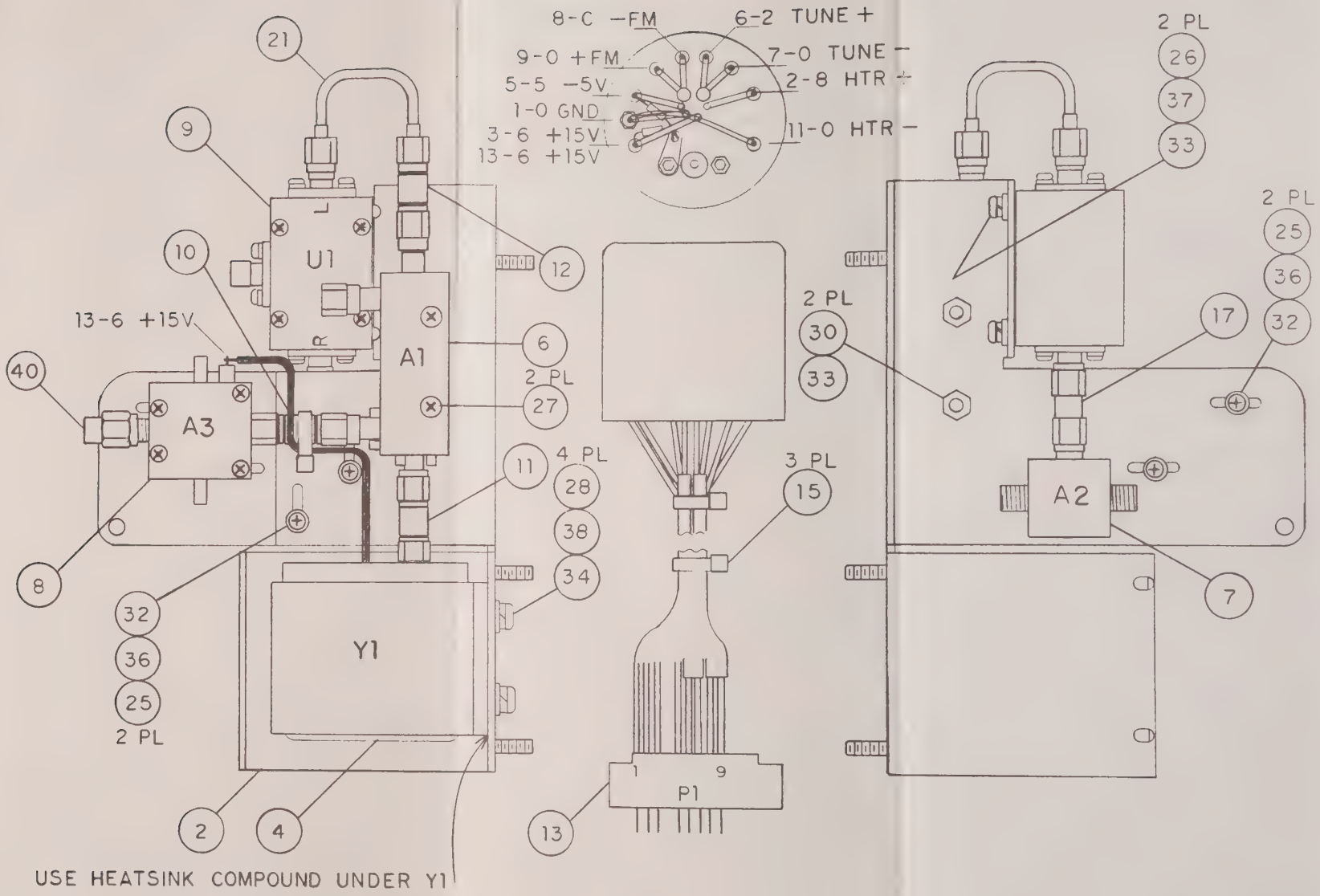


Figure 5-42. 2 — 8 GHz Reference Bracket A33 (Systron Donner No. 08320301)

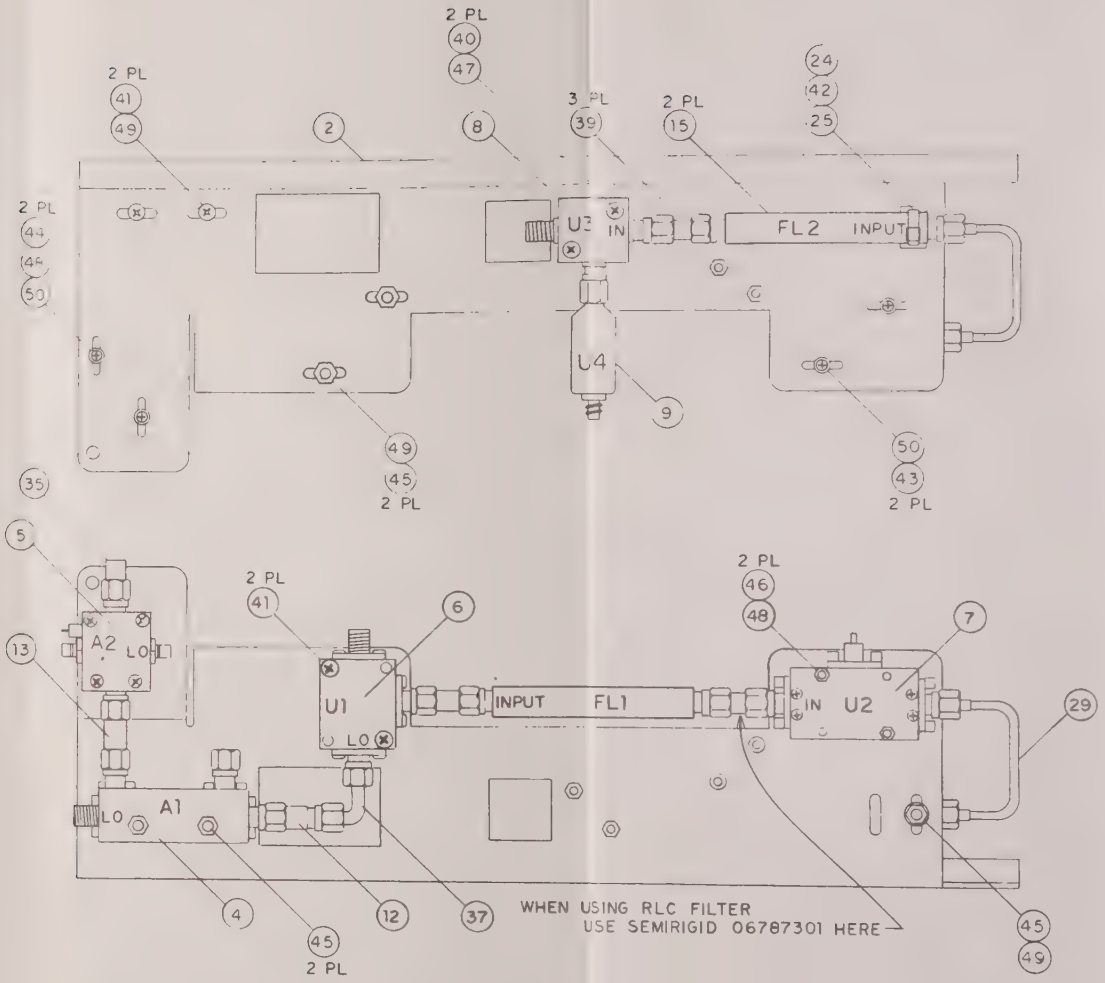
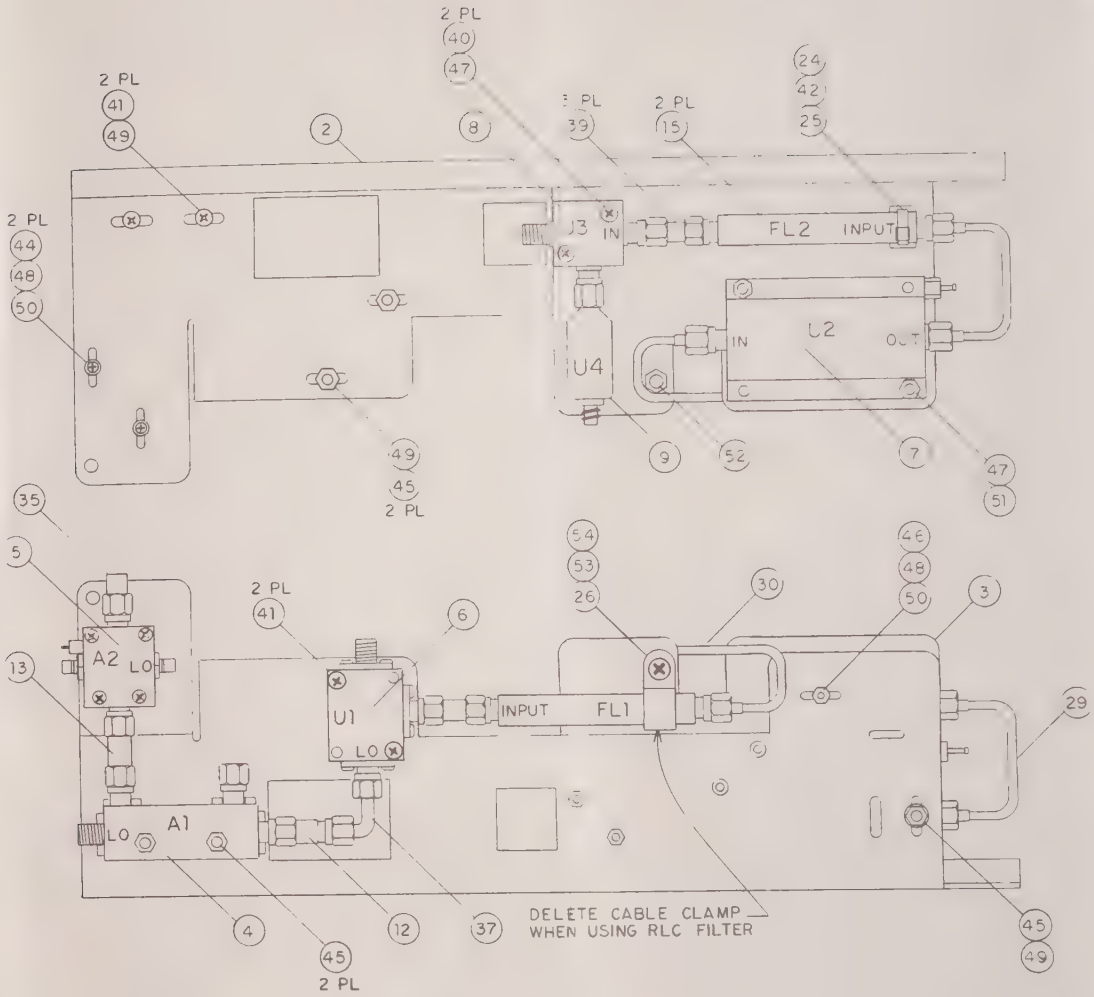


Figure 5-43. Downconverter Bracket A34 (Option 01) (Systron Donner No. 08369801) (Sheet 1 of 2)



NOTE: 08369801 IS A DIRECT REPLACEMENT FOR 08369802.

Figure 5-43. Downconverter Bracket A34 (Option 01) (Systron Donner No. 08369802) (Sheet 2 of 2)

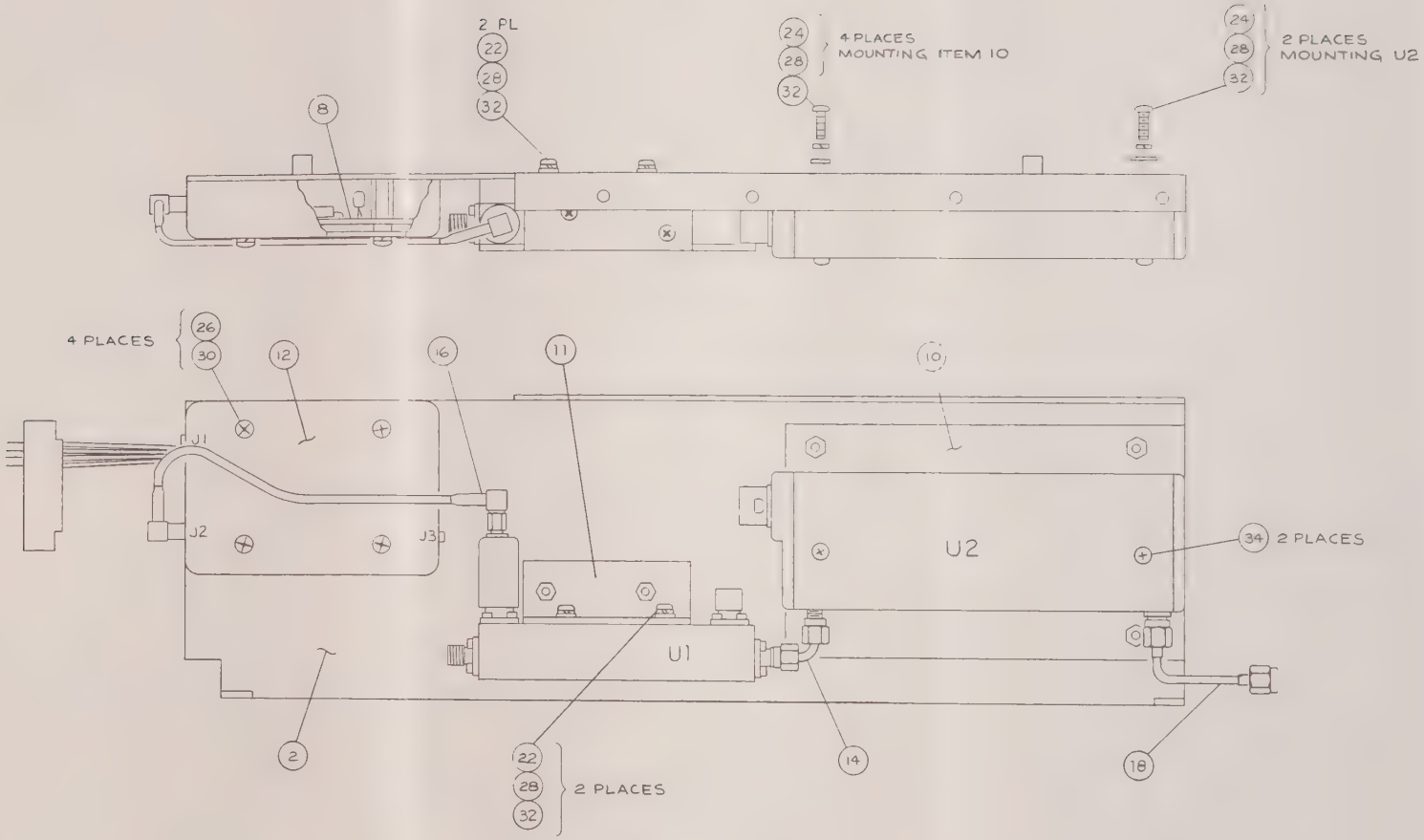


Figure 5-44. Front Output Bracket A35 (Standard) (Systron Donner No. 08320602)

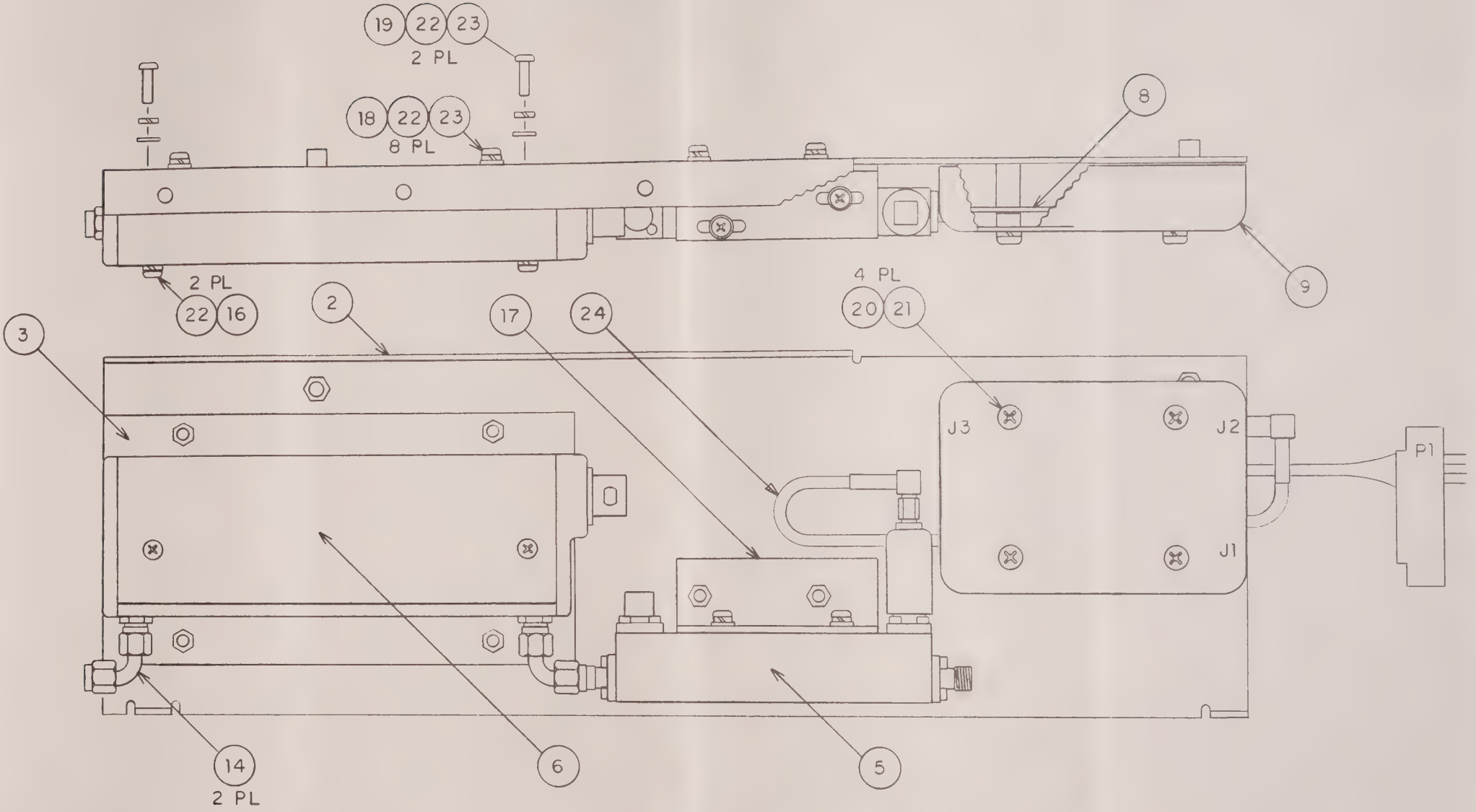


Figure 5-45. Rear Output Bracket A35 (Option 05)
(Systron Donner No. 08320603)

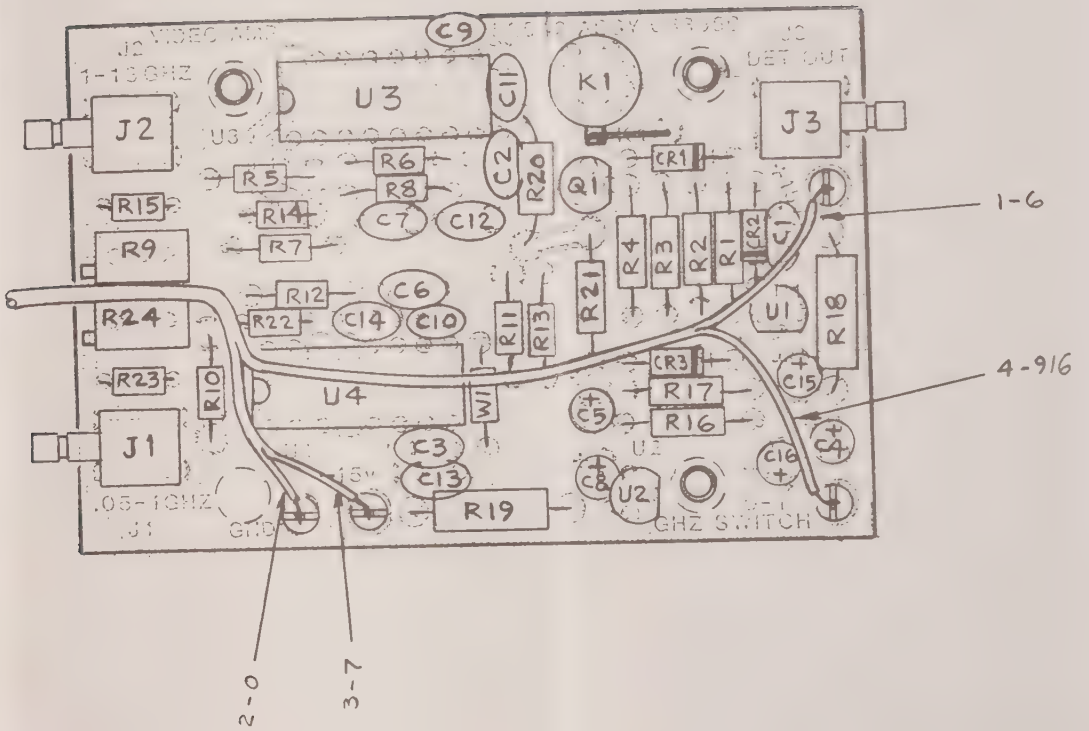


Figure 5-46. Video Amplifier A35A1 P.C. Board Assembly (Systron Donner No. 08365001)

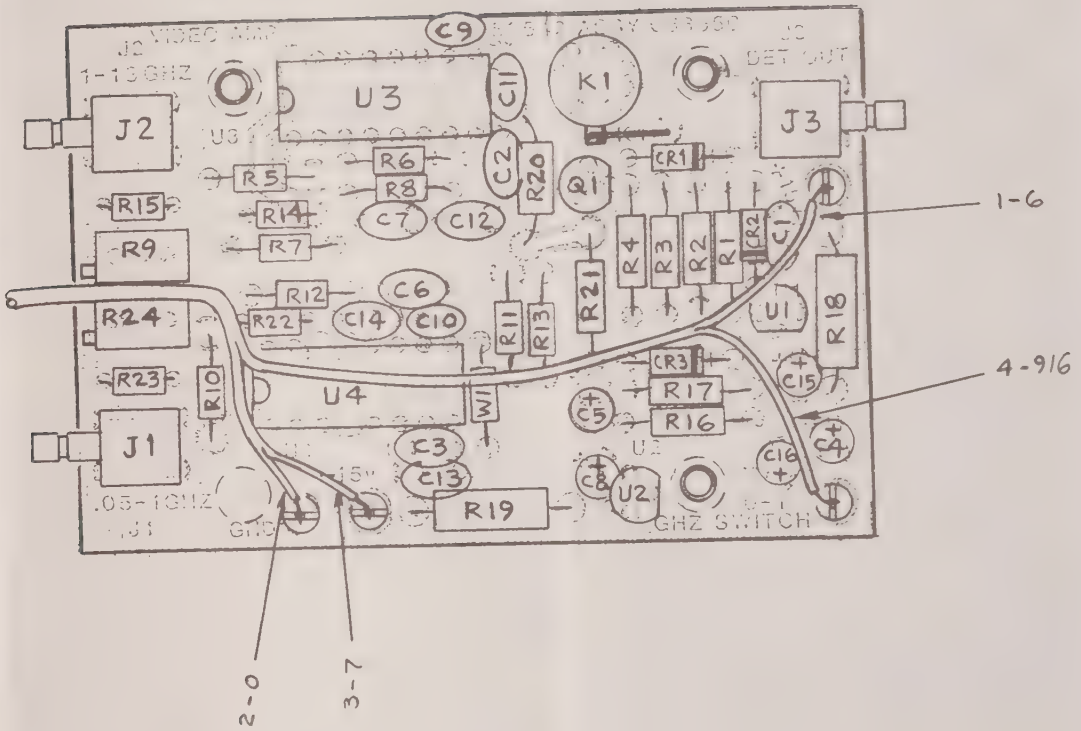


Figure 5-46. Video Amplifier A35A1 P.C. Board Assembly (Systron Donner No. 08365001)

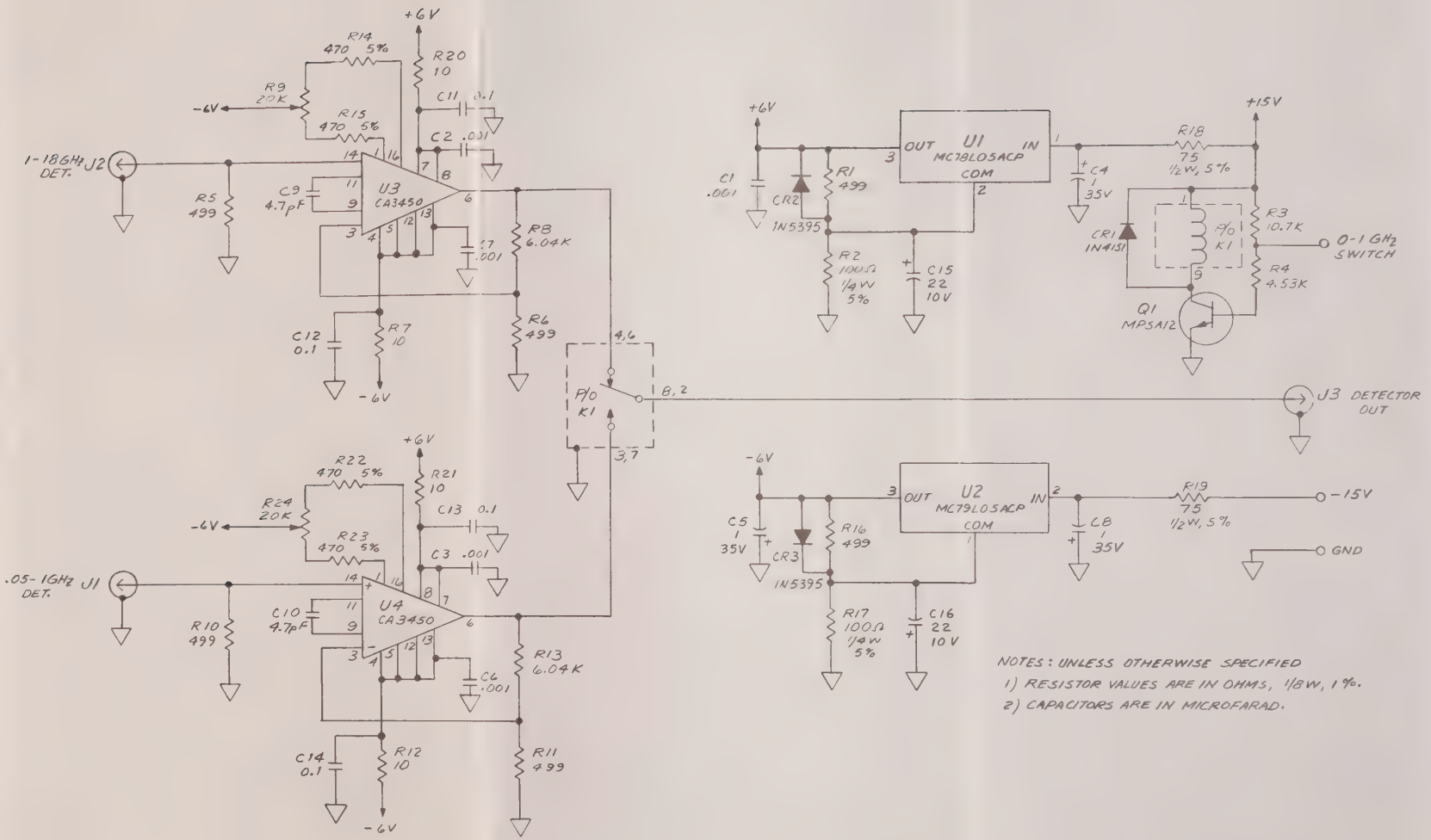


Figure 5-47. Video Amplifier A35A1 Schematic (Systron Donner No. 708365001)

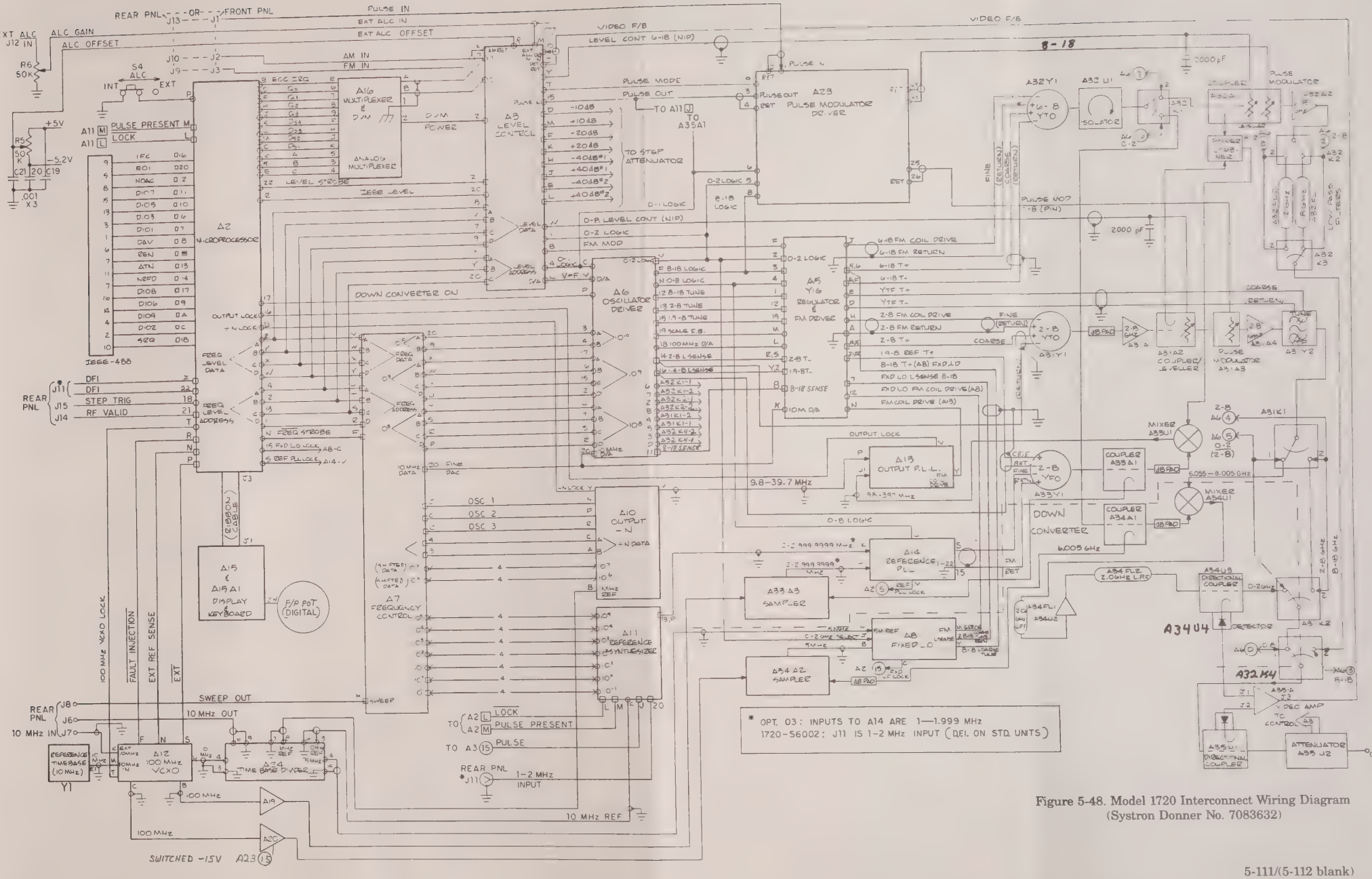


Figure 5-48. Model 1720 Interconnect Wiring Diagram (Systron Donner No. 7083632)

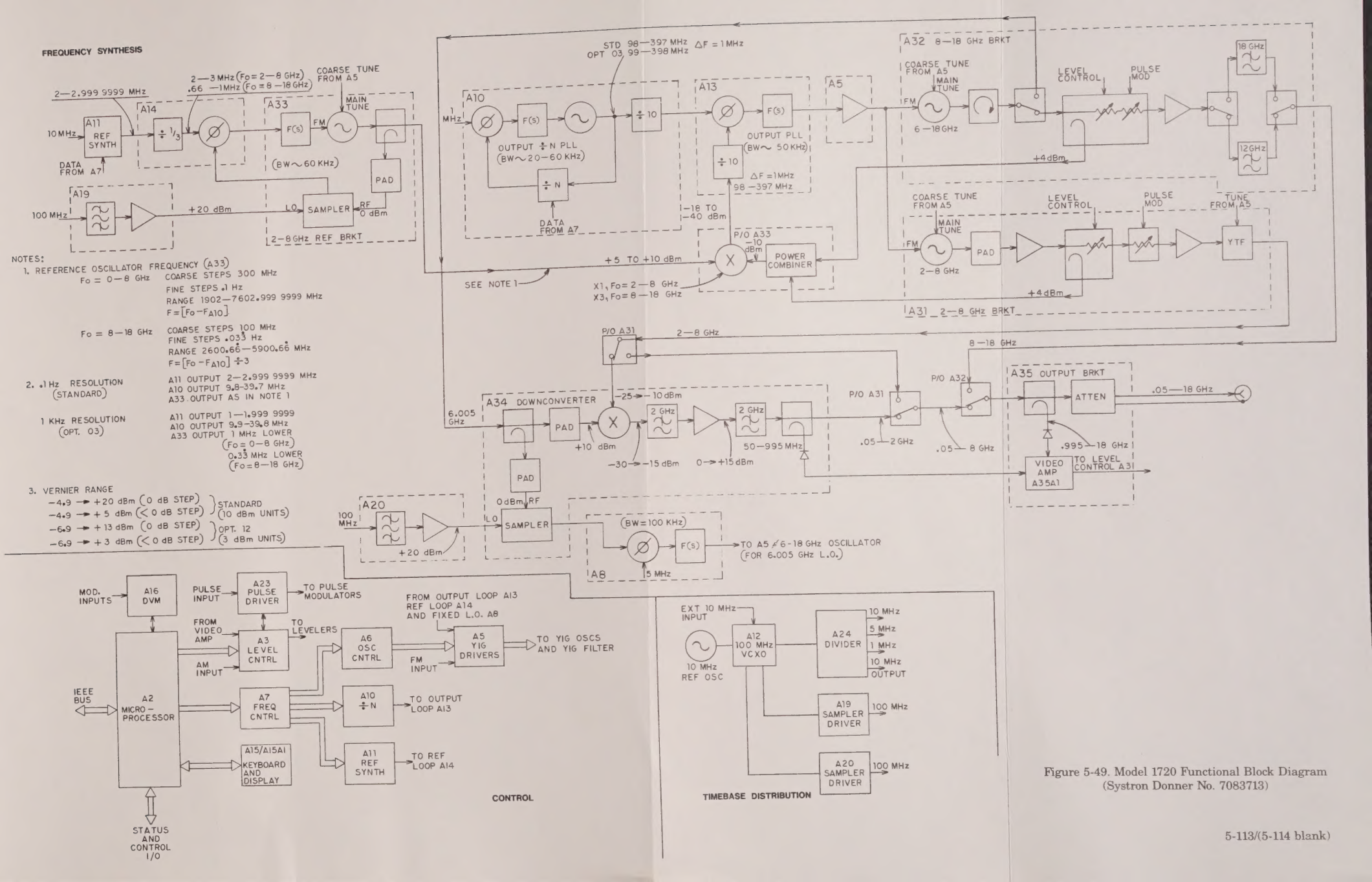


Figure 5-49. Model 1720 Functional Block Diagram (Systron Donner No. 7083713)

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